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Final
Work Plan Addendum to the Revised Final Compliance Status Report Investigation for Interim Removal Activities at the Former Fire Training Area (HAA-01)

3d Inf Div (Mech)

Hunter Army Airfield, Savannah, Georgia

September 2003

Submitted to:
U.S. Army Corps of Engineers
Savannah District
Contract No. DACA01-03-D-0010
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for
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at the Former Fire Training Area (HAA-01)
Hunter Army Airfield
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Acronyms and Abbreviations

AST	aboveground storage tank
ASTM	American Society of Testing and Materials
bgs	below ground surface
CLP	contract laboratory program
COC	chain of custody
COE	Corps of Engineers
CSR	Compliance Status Report
DPW	Directorate of Public Works
DVR	data validation reports
EPA	United States Environmental Protection Agency
EQL	estimated quantitation limit
FID	flame ionization detector
FTA	Fire Training Area
HAAF	Hunter Army Airfield
IDW	investigation derived waste
IRA	Interim Removal Action
LCS	laboratory control sample
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCBs	polychlorinated biphenyls
PID	photo ionization detector
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RPD	relative percent difference
SDG	sample delivery group
SOW	scope of work
STEP	Solutions To Environmental Problems, Inc.
SVOC	semivolatile organic compound
TCL	target compound list
VOC	volatile organic compound

1.0 INTRODUCTION

Solutions To Environmental Problems, Inc., (STEP), has been contracted by the United States Army Corps of Engineers, Savannah District, to perform an Interim Removal Action (IRA) at the former Fire Training Area (FTA), Hunter Army Airfield (HAAF), Georgia. This document, hereinafter known as the Work Plan, provides the details of removal activities and field procedures that will be followed during the IRA.

1.1 PURPOSE OF THIS WORK PLAN

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

1.2 SCOPE

The objectives of this scope of work (SOW) are to:

- remove monitoring well HMW-7 and the free product belt skimmer installed in HMW-7,
- excavate an area of 15 feet by 15 feet by 8 feet deep surrounding well HMW-7,
- install a new monitoring well, at the same location as HMW-7, with pre-pack screen,
- install a new monitoring well, down-gradient of HMW-7,
- collect five soil samples from the excavation at HMW-7,
- develop and collect one groundwater sample from the newly installed down-gradient well, and
- sample and dispose of the investigative derived waste (IDW).

1.3 PROJECT ORGANIZATION

The project organization and key personnel for these investigations are shown in Figure 1-1. Contact information for key personnel is listed below.

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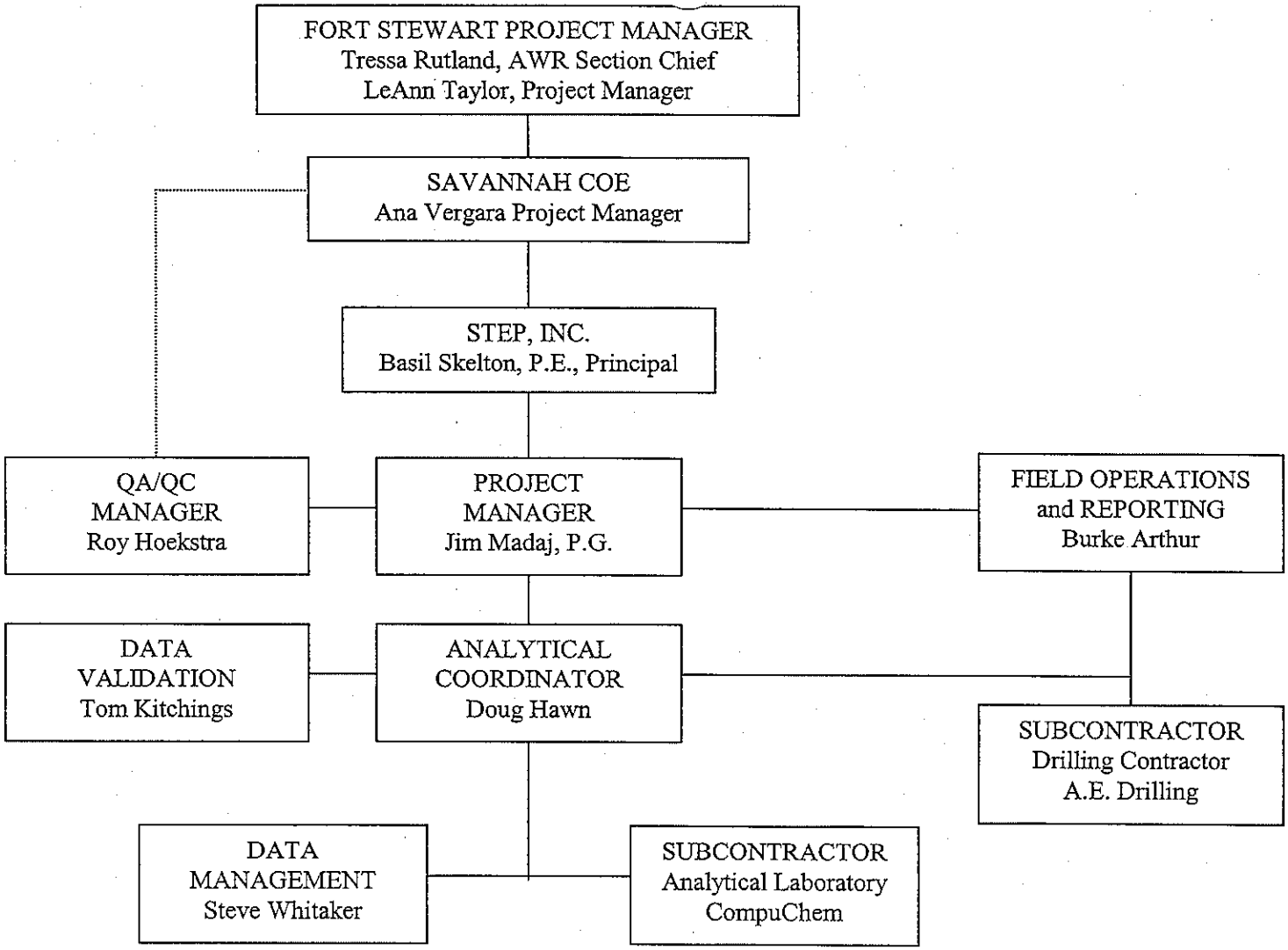

Figure 1-1 Organizational Chart

IRA at the Fire Training Area

2.0 SITE BACKGROUND

HAAF is located in Chatham County, Georgia, within the southwest portion of the city of Savannah. The Installation is bounded to the north by the city of Savannah, to the east and south by residential and light commercial areas, and to the west by the Little Ogeechee River. Presently, HAAF serves as an aircraft support base for the U.S. Coast Guard and the U.S. Army military post, Fort Stewart, located 50 miles to the west.

3.0 SITE DESCRIPTION

This section provides a site-specific description and results of previous investigations.

3.1 FIRE TRAINING AREA SITE DESCRIPTION

The former FTA was located in the northwest portion of HAAF and is approximately 800 feet northwest of the control tower. The site consisted of approximately 2 acres of cleared grassy area and contained a 6,400-square-foot concrete fire training pad, and 18,000 gallon aboveground storage tank (AST). The pad was covered with sand and gravel and surrounded with a concrete curb. The fire training pad held a simulated aircraft, constructed from a steel tank, which was utilized for training activities (LAW, May 2002). Fuels used in training exercises at the FTA were stored in an aboveground steel storage tank, with a capacity of approximately 18,000 gallons. The tank was located approximately 112 feet due north of the fire training pad and was surrounded by an earthen berm approximately 2.5 feet high. The fuel was transferred to the fire training pad via an underground line, approximately 142 feet in length. The former FTA is shown in Figure 3-1.

The former FTA is bounded on the northwest and south by drainage ditches, by the airfield pavement on the east, and by wooded land on the southwest. Topographic relief in the vicinity of the site is approximately 21 feet. Elevations at the site range from 35 feet above mean sea level (msl) to 14 feet above msl (ESE, June 1993). The topography at the site slopes gently west toward the Springfield canal. The canal flows southwest before emptying into the Little Ogeechee River floodplain.

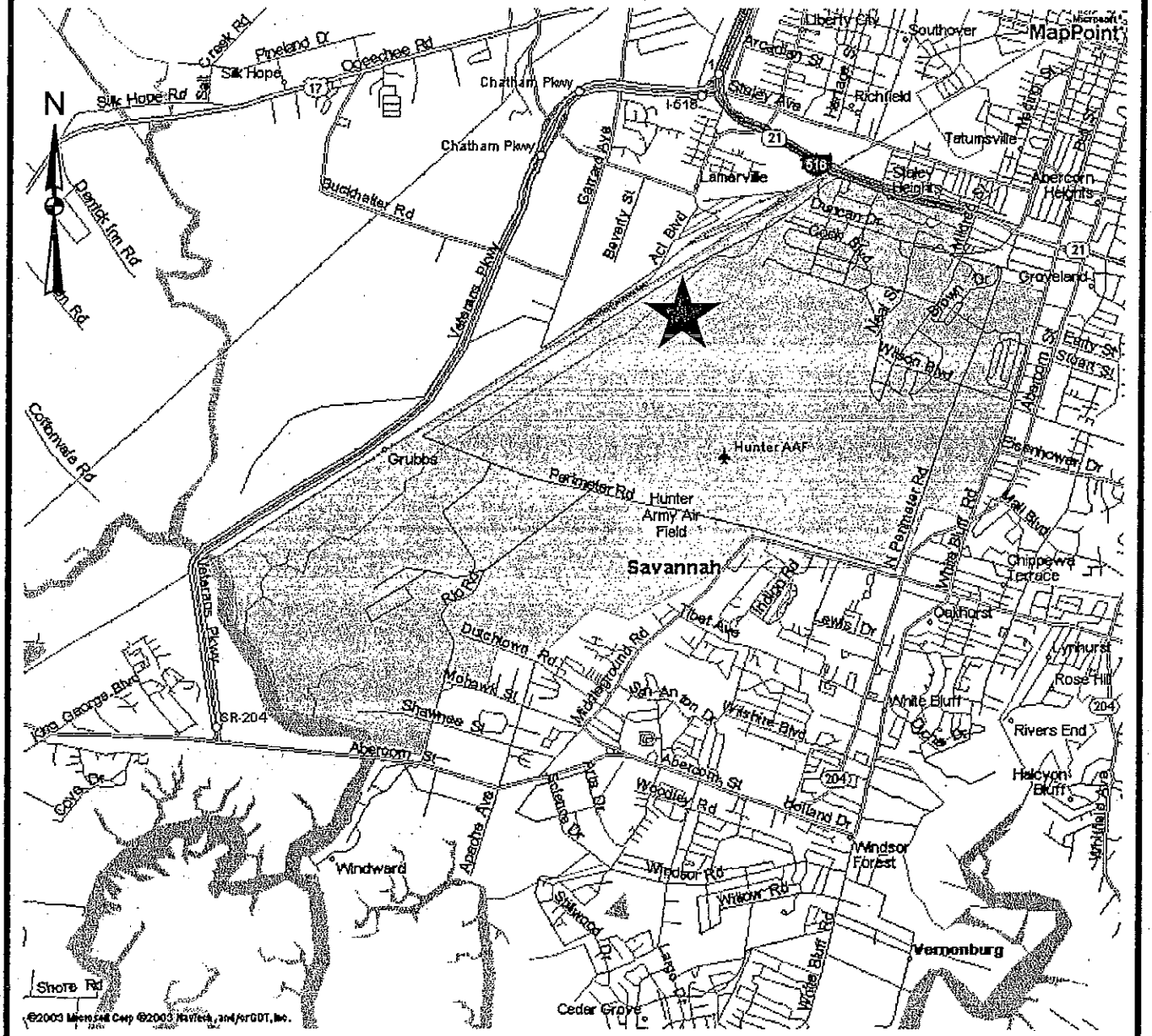

Figure 3-1 114-113-002 haaf fire.apr 08/15/03

LEGEND

★ WORK SITES

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Oak Ridge, TN
Job Title: Fire Training
Hunter Army Airfield
Savannah, Georgia

Figure 3-1 Site Location Map

3.2 PREVIOUS INVESTIGATIONS

The U.S. Army Environmental Hygiene Agency (USAEHA) conducted a preliminary contamination assessment in March 1987 that consisted of drilling and sampling the soil surrounding the fire training pad. Metals, polynuclear aromatic hydrocarbons (PAHs) and phthalates were detected in the surrounding soil.

From 1990 to 1992 Environmental Science and Engineering (ESE) installed nine groundwater monitoring wells, six soil borings, and collected seven sediment samples to further define soil and groundwater contamination. The ESE investigation revealed that the surface soils and drainage ditch sediment were impacted by volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), while the groundwater was impacted by VOCs. The investigation did not fully define the extent of contamination in the soils. The results of ESE assessment are provided in the *Final Significance of Contamination Report*, dated June 1993.

In December of 1995, LAW installed four monitoring wells, seventeen soil borings, and collected groundwater and soil samples. The analytical results of the soil samples confirmed the presence of VOC and SVOCs, and delineated the extent of soil contamination. Although groundwater contamination was vertically delineated to approximately 35 feet below ground surface (bgs), the horizontal extent was not fully measured. Free product was also found in monitoring well HMW-7.

From November 1997 to March 1998, Omega Environmental Services and Geosciences, Inc. conducted soil remediation activities at the former FTA. The simulated aircraft structure, aboveground storage tanks, underground fuel transmission lines, concrete pad, and contaminated soil were removed. Results from the confirmatory soil samples however, showed that persistent soil contamination remained. Detailed information is presented in the *Soil Remedial Action Report*, dated December 1998.

Following the soil remediation, Fort Stewart began free product recovery by activating a belt-skimmer at monitoring well HMW-7. Approximately 3 gallons of free product were removed between February 1999 and October 1999. The system operation cycle was adjusted to optimize free product recovery. In December 1999, six product delineation points were installed around HMW-7. The points were periodically measured for the presence of free product from December 1999 until March 2000, however free product was not encountered in any of the points.

From July 1999 to January 2000 LAW conducted additional investigation of the soil and groundwater contamination at the FTA in order to obtain data for a Compliance Status Report (CSR). The investigative activities included the installation of soil borings, soil sampling, installation of groundwater monitoring wells, groundwater sampling, and a human and ecological exposure assessment. Results showed that the extent of VOCs and SVOCs in the soil, and VOCs in groundwater was not completely identified. In addition, PCBs and pesticides were found in soil, and SVOCs and metals in were found in groundwater, but the extent of these contaminants was identified.

Field investigations for the *Revised Final CSR*, dated May 2002 were completed in October and November 2001, and included the installation of soil borings, soil sampling, installation of groundwater monitoring wells, groundwater sampling, a soil background study of metals, and surface water sampling. The Revised Final CSR stated that the extent of VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals in the surface and subsurface soils was delineated. The extent of SVOCs and metals in the groundwater was also delineated. VOCs in the groundwater to the north of the former fire training pad were not delineated. Results showed that the soil and groundwater at the former FTA were not in compliance with Types 1 through 4 Risk Reduction Standards. During the ecological preliminary risk evaluation, no unacceptable risks to wildlife receptors were identified from contamination in groundwater and soil at the site.

4.0 INTERIM REMOVAL ACTIVITIES

Objectives of the IRA that STEP will perform are to remove the belt-skimmer, remove monitoring well HMW-7, install a new groundwater monitoring well in the former location of HMW-7, install a new down-gradient groundwater well, and collect soil and groundwater samples. Before beginning IRA activities, utility clearance shall be obtained. The STEP project manager will coordinate with Ms. LeAnn Taylor [Directorate of Public Works (DPW) Environmental] to locate utilities in the vicinity of field activities and arrange for disconnection of electrical service to the belt-skimmer. A site map is shown in Figure 4-1.

4.1 REMOVE FREE PRODUCT BELT SKIMMER

After obtaining the utilities clearance and disconnecting electrical service, the belt skimmer will be removed from monitoring well HMW-7. The belt-skimmer and associated equipment components will be transported to the HAA-03 fenced area for storage.

North

HMW-21
HMW-14R
HMW-22
HMW-14
HMW-20
HMW-15
HMW-13
HMW-8
HMW-9
HMW-1
HMW-2
HMW-3
HMW-4
HMW-10
15' x 15' Excavation
HMW-7
New Down Gradient Well
HMW-19
HMW-16
HMW-11
HMW-6
HMW-5
HMW-17
HMW-18
HMW-12
SD
SS
T
E

Legend:

- New Monitoring Well
- HMW-2 Existing Monitoring Well
- Tree Line
- SS Sanitary Sewer
- SD Storm Drain
- T Telephone
- E Electric
- Fuel Line

200' 0 200'
SCALE: 1" = 200'

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Source: USACE
Job Title: Former Fire Training Area
Hunter Army Airfield
Savannah, Georgia

Prepared For: USACE
Savannah District

Figure 4-1 Fire Training Area

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4.2 MONITORING WELL REMOVAL, SOIL REMOVAL ACTION, AND INSTALLATION OF THE EXCAVATION PIT WELL

STEP personnel will use a rubber tire backhoe to excavate and remove monitoring well HMW-7. The material used to construct the monitor well, including any surface components (i.e. concrete pad, protective casing, and bollards) will be handled as petroleum-contaminated non-hazardous construction debris. This debris will be appropriately disposed in a permitted landfill. The excavated material will be field screened utilizing visual and instruments (FID) for petroleum contamination. The excavated material will be separated into non-contaminated and contaminated spoil piles, based on field screening results. The non-contaminated material will be utilized for backfill cover.

Excavation activities will continue in the vicinity of monitoring well HMW-7, expanding the pit to an area of 15 feet by 15 feet by 8 feet deep. When this is complete, five confirmatory soil samples will be collected from the excavation. One soil sample will be collected from the center of the four excavation walls and one from the center of the excavation floor. However, if visual observation or field-screening results reveal signs of petroleum, the sampling locations will be biased towards areas of suspected contamination. Confirmatory soil samples will be analyzed for VOCs. Table 4-1 shows the method and estimated sample quantities. The backhoe will be used to collect soil samples from the excavation walls and floor, and personnel will not be allowed into the excavated pit. Excavated soil material will be placed in a roll-off container for disposal at a permitted disposal facility. Soil samples will be collected from the excavated material for characterization and to determine disposal requirements.

After collecting confirmatory samples, STEP will install an excavation pit well. The components used for construction of the well will consist of four inch diameter well material with five foot pre-packed well screen and riser pipe. The well will be positioned inside the excavation using suitable supports and a gravel backfill will be used inside the excavation. The gravel backfill will extend to approximately one foot above the top of the well screen. The backfill of the excavation will be completed using clean soil. If a borrow site is required to complete the backfill of the excavation, STEP's project manager will coordinate this activity with DPW Environmental personnel. The well will be completed with a concrete pad, protective casing, and bollards. After installation of the excavation pit well, STEP will use an interface probe to check the well for free product.

Table 4-1 Analytical Methods and Estimated Sample Quantities for Soil Samples

Sample Information	TCL VOCs
Method	SW8260
Number of Samples	5
Field Duplicates	1
Equipment Rinsates	1
Field Blanks	1
Trip Blanks	1
MS/MSD	1
Total Analyses	10

MS/MSD = matrix spike/matrix spike duplicate
TCL = target compound list
VOC = volatile organic compound

Notes:

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

4.3 INSTALLATION OF DOWNGRADIENT MONITORING WELL

STEP personnel will also install a downgradient well within 25 feet of the excavation's edge. The well will be installed using conventional drilling techniques and hollow stem augers to a total depth of 15 feet. The well will be constructed using two inch diameter poly vinyl chloride (PVC) materials, and the well screen will be factory slotted PVC material 10 feet in length. The surface area will be completed with a concrete pad, protective surface casing, and bollards. After installation, the new well will be developed and sampled. Table 4-2 shows the analytical method and estimated sample quantities for groundwater. Soil IDW generated during the well installation will be placed in the roll-off container for disposal as petroleum-contaminated waste.

Table 4-2 Analytical Methods and Estimated Sample Quantities for Groundwater Samples

Sample Information	TCL VOCs
Method	SW8260B
Number of Samples	1
Field Duplicates	1
Trip Blanks	1
Equipment Rinsates	1
Field Blanks	0
MS/MSD	1
Total Analyses	5

MS/MSD = matrix spike/matrix spike duplicate TCL = target compound list
VOC = volatile organic compound
Notes:

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

4.4 SAMPLING CRITERIA AND RATIONALE

4.4.1 Fire Training Area

STEP will conduct confirmatory soil sampling activities at the FTA to evaluate the presence of residual subsurface soil contamination remaining at the site. Five soil samples will be collected from the excavated area at the FTA. Using a flame ionization detector (FID) or a photo ionization detector (PID), excavated material will be scanned to identify possible petroleum contamination in the subsurface soils.

STEP personnel will collect one groundwater sample from the newly installed downgradient monitoring well using the low flow sampling technique.

5.0 FIELD INVESTIGATION TECHNIQUES AND PROCEDURES

5.1 SITE RECONNAISSANCE, PREPARATION, AND RESTORATION PROCEDURES

Before the start of field activities, all excavation permits and utility clearances for the specified investigation locations will be obtained in coordination with the Corps of Engineers project manager and

DPW Environmental personnel. The well installation/excavation locations will be marked on the ground before field activities begin.

A portable decontamination containment unit will be used to collect investigative derived waste (IDW) from decontamination activities. Drilling and sampling equipment will be decontaminated with a high pressure steam cleaner. Sampling equipment will be decontaminated in accordance with U.S. Environmental Protection Agency (EPA) Region 4 guidelines. Management of IDW during decontamination activities will be consistent with the management of IDW generated during groundwater sampling activities.

5.2 MONITORING WELL INSTALLATION AND DEVELOPMENT

5.2.1 Monitoring Well Installation

Monitoring wells are installed to provide access to groundwater for collecting samples and for obtaining other groundwater information. Because monitoring wells are used to collect samples, it is imperative that construction materials not interfere with sample quality either by contributing contaminants or by sorbing contaminants already present. Further, construction materials must be compatible with (not degraded by) contaminants or other subsurface conditions present in soils or groundwater.

Monitoring wells are potential contaminant migration routes between water bearing zones or from the surface to the subsurface. Construction procedures and standards must ensure that neither passive nor active introduction of contaminants can occur. Properly installed hydraulic seals, isolation casing, and locking well covers reduce the potential for cross-contamination through monitoring wells. The new down-gradient monitoring well will be installed in accordance with guidance set forth in U.S. Army Corps of Engineers document EM1110-1-4000, *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites.*

5.2.2 Well Development

Monitoring wells are developed to create an effective filter pack around the well screen, to repair damage to the formation caused by drilling, to remove the "skin" from the borehole, to remove liquids introduced during drilling, and to remove fine-grained particles from the filter pack and the adjacent formation. When a cement-bentonite grout is used to seal the annular space, wells should not be developed for a minimum of

24 hours after completion to allow the grout to cure. The new down-gradient monitoring well will be developed by surging and pumping. Several indicator parameters of the produced water should be monitored to assist in the proper development of monitoring wells. These indicator parameters should include pH, specific conductance, water temperature, and (if appropriate) turbidity.

5.3 SAMPLING PROCEDURES

5.3.1 Subsurface Soil Sampling

For the purpose of this document, subsurface soil samples are those samples collected in the unconsolidated zone at a depth of one ft or greater bgs. Soils samples collected during the excavation around HMW-7 are anticipated to be greater than one-foot bgs. The soil samples will be collected using the backhoe bucket. A soil sample will be collected from the center of each excavation wall and from the excavation floor. STEP personnel will place the soil sample into the appropriate container. The container will then be sealed and labeled for chemical analysis for VOCs. The samples will immediately be placed inside a cooler on ice. Once all primary and QC samples have been collected the cooler will be packaged and sealed for shipment to the laboratory. A chain of custody will be completed and will accompany the samples to the laboratory.

5.3.2 Groundwater Purging and Sampling

Before groundwater sampling, wells are purged to remove stagnant water so a representative groundwater sample may be collected. Purging continues until the groundwater parameters such as pH, conductivity, temperature, and turbidity (if appropriate) stabilize. Wells should be sampled within 3 hours of purging (optimum) to 24 hours after purging (maximum, for low-recharge conditions).

In an effort to collect the most representative groundwater sample possible with a minimum of disturbance to the aquifer, "low flow" sampling will be utilized. The technique for low flow sampling requires a pumping rate not greater than 300 milliliters/minute. This pumping rate must be below the recharge capability of the aquifer. The water level is monitored to ensure that the level remains constant. After indicator parameter readings have stabilized groundwater sampling can begin.

6.0 Investigative Derived Waste

All IDW will be disposed of properly and in accordance state and federal regulations. All soil IDW will be stored in a lined roll-off container and water IDW will be stored in drums at a nearby area designated by Corps of Engineers or Fort Stewart representatives until the chemical testing results are received.

Each IDW container will be labeled in accordance with appropriate State and Federal requirements. IDW shall be labeled "UNCLASSIFIED WASTE, ANALYSIS PENDING". In addition, the following information shall be included on the waste label; the well number, STEP's point of contact and telephone number, the Corps of Engineers point of contact and telephone number, and a description of the contents. The area(s) in which the IDW is stored will be flagged with surveying tape and stakes. All other wastes (e.g., trash, tyvek suits, gloves, respirator cartridges, etc.) will be disposed off-site in accordance with all applicable regulations.

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

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

7.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND REQUIREMENTS

7.1 INTRODUCTION

This section presents the overall policies and specific QA/QC requirements that will be employed during this IRA at HAAF. The overall objective is to establish guidelines for field sampling, documentation, laboratory analysis, over-all (QA/QC) procedures, and reporting that will result in data of known quality for the IRA.

7.2 DATA CATEGORIES

This section outlines the QC procedures and requirements necessary to provide definitive level data. The overall QC objective is to develop and implement procedures that will ensure sufficient quality in field sample collection, fixed-base laboratory analysis, and reporting that will meet the needs of end users of the data. QC objectives for precision, accuracy, representativeness, completeness, and comparability (PARCC) of the analytical data are discussed in Section 7.3. Documentation requirements including field logbooks, chain-of-custody, and field change order requests are located in Sections 7.4 and 7.5.

7.2.1 Field Quality Control Samples

Field duplicate samples, source water check samples, equipment rinsates, and trip blanks will be submitted to the analytical laboratory to provide the means to assess the quality of the data resulting from the field sampling program. Source water check samples and trip blanks will be analyzed to check for procedural contamination and ambient conditions at the site that may have caused sample contamination. Field duplicate samples will be submitted to provide a QC check on analytical procedures and results and to provide an indication of sampling procedures and the representativeness of results. The QC samples and required frequencies are described below.

7.2.2 Trip Blanks

Trip blanks are used to detect contamination by VOCs during sample shipping and handling. Trip blanks are 40-mL vials of analyte-free water that are preserved with hydrochloric acid to pH $\leq$ 2. The laboratory performing the analysis will supply trip blanks. Trip blanks must have zero headspace and should not be opened in the field. One trip blank will be placed in each cooler containing soil and/or water samples for VOC analysis that is submitted to the fixed-base laboratory. Trip blanks are analyzed for VOCs only.

7.2.3 Source Water Check Samples (Field Blanks)

Source water check samples are QA/QC samples intended to determine if any of the water used during a given field event contains detectable concentrations of target analytes that may impact the quality of the samples. Source water check samples are samples of the source water used during decontamination and steam cleaning. At a minimum, one sample for each source of water will be collected and analyzed for the same parameters as the original samples of interest. Source water check samples will be collected and analyzed at a frequency of 1 per water source per field event. American Society of Testing and Materials

(ASTM) Type II water used for final rinsing, as well as the tap water used for initial cleaning, are sources of water that are commonly sampled.

7.2.4 Equipment Rinsates

Equipment rinsates are used as a measure of the effectiveness of the decontamination process. Equipment rinsates are samples of the final analyte-free water rinse from equipment cleaning and are submitted to the fixed-base laboratory for analysis. The rinsates will be analyzed for the same analytes as the samples that are collected. Samples will be collected for every type or piece of equipment at a frequency of one for every 10 investigative samples collected per sample matrix.

7.2.5 Field Duplicates

Field duplicates are used to assess the precision of sampling techniques and to provide checks on laboratory and field procedures. Field duplicates will be collected at a frequency of one for every 10 samples collected per sample matrix.

7.2.6 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS and MSD samples are samples from a specific media that have been spiked at the laboratory with known quantities of target analytes. MS and MSDs are used to determine the accuracy and precision of the laboratory analyses as well as matrix interference. Data from MS and MSD samples supply percentage recovery information so the laboratory can evaluate its measurement accuracy and precision. MS and MSD samples are equal portions of a single initial sample that have been spiked with specific analytes in known quantities and must meet certain laboratory requirements to be acceptable. The total number of MS/MSD samples will be at a frequency of one per 20 samples collected, per sample matrix.

7.2.7 Sample Collection, Preservation, and Holding Times

Procedures for collecting samples will follow EPA protocols. Samples will be collected with properly decontaminated equipment and contained in properly cleaned sample containers. The steps required for sample control and identification, data recording, and chain-of-custody documentation are discussed in Sect. 7.4. All field sampling equipment will be decontaminated before use and after each sample location.

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

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

7.3 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, AND COMPLETENESS OBJECTIVES

This section presents general objectives for the level of QC expressed as PARCC for the analytical data. The precision and accuracy of laboratory analytical data must satisfy the QC acceptance criteria of the analytical protocols for approved USEPA methods.

7.3.1 Quality Assurance Objectives for Accuracy

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement comes to the true value, or actual concentration, the more accurate the measurement. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at a known concentration before analysis. The following equation is used to calculate percent recovery:

$$\text{Percent Recovery} = [(A_r - A_o) / A_f] \times 100$$

Where:

A_r = Total amount detected in spiked sample,

A_o = Amount detected in unspiked sample,

A_f = Amount of spike added to sample.

Analytical accuracy will be ensured by performing all method specified QC steps. For organic parameters, accuracy is measured by the percent recovery of surrogate spikes and MS/MSDs.

For inorganic parameters, accuracy is measured by the percent recovery on matrix spikes and laboratory control samples (LCSs). Matrix spike recovery limits for inorganic parameters are 75-125%, and LCS recovery limits are 80-120%. The general objective for analytical accuracy is to meet 90% or more of all surrogate compound, MS/MSD, and LCS recoveries.

7.3.2 Quality Assurance Objectives for Precision

Precision is defined as the reproducibility, or degree of agreement, among duplicated (collocated) sample measurements of the same quantity. The closer the numerical values of the measurements come to each other, the more precise the measurement is. Analytical precision is expressed as a percentage of the difference between results of duplicate samples for a given analyte. For organic parameters, precision is measured by the relative percent difference (RPD) between the MS and the MSD. For inorganic parameters, precision is measured by the RPD between the original sample and the duplicate or the MS and MSD (if required by the analytical method performed). RPD is calculated as:

$$RPD = \{C1+C2\}/ 2 \times 100$$

Where:

C_1 = Concentration of the analyte in the sample,

C_2 = Concentration of the analyte in the duplicate/replicate.

The RPD between field duplicate sample results is an indication of sampling and analytical laboratory precision. The following acceptance criteria will be used to assess field duplicate sample precision.

- If both results are >5X the estimated quantitation limit (EQL) or reporting limit, then the RPD between the two results should be $\leq$70% for soil samples and $\leq$40% for water samples.
- If one or both results are <5X the EQL or reporting limit, then the difference between the two results should be $\leq$4X the EQL or reporting limit for soil samples and $\leq$2X the EQL or reporting limit for water samples.

The overall goal for sampling and analytical precision is for 90% or more of data to be within required or method-recommended RPD limits.

7.3.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter dependent on the proper design of the sampling program and proper laboratory protocol. Representativeness will be ensured by using proper sampling techniques and analytical procedures. Representativeness is ensured in the laboratory by proper sample preservation and storage, preparation and analysis of samples within required holding times, and analysis of method and instrument blanks. Field QC samples—including trip blanks, source water check samples, and equipment rinsates—will be collected and analyzed to evaluate the possibility of cross-contamination during sample collection and shipping. Results of field duplicate samples will also be evaluated for assessing representativeness.

7.3.4 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared with another, and is limited to the other parameters, because only when precision and accuracy are known can data be compared with confidence. The sampling and analytical procedures described in this plan that will be used to obtain analytical data are expected to provide comparable data. Comparability will be further ensured by the analysis of EPA standard reference materials, establishing that analytical procedures are generating valid data, and reporting results in standard concentration units.

7.3.5 Completeness

Completeness is defined as the amount of valid (useable) data obtained compared to the planned amount and is expressed as a percentage of measurements judged to be valid. Completeness is usually measured following data validation. Data qualified as a result of validation can be considered valid data; rejected data are not valid. The completeness goal is to generate a sufficient amount of valid data based on project needs. In general, a level of 90% or better will be required. Percent completeness for analytical data can be expressed by the following formula.

$$\text{Completeness} = \frac{\text{Number of useable valid data points reported}}{\text{Total number of analytes for each parameter analyzed}} \times 100\%$$

7.4 SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES

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

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

7.4.1 Sample Identification

A standardized system will be used to identify all samples collected during IRA activities. The field sample number is a unique number assigned to each individual sample collected and relates a specific result set to the location from which it was collected. The numbering system provides a tracking procedure to ensure accurate data retrieval of all samples taken. Field sample numbers will consist of up to eight alphanumeric characters, all uppercase. Examples of the numbering system are as follows.

Field Sample Identification

03102S01	03	=	2003	03102U02	03	=	2003
	102	=	102nd day of 2003		102	=	102nd day of 2003
	S	=	surface soil sample		U	=	subsurface soil sample
	01	=	sequence number		02	=	sequence number
03102G01	03	=	2003	QCTB013	QC	=	quality control sample
	102	=	102nd day of 2003		TB	=	trip blank
	G	=	groundwater sample		13	=	sequence number
	01	=	sequence number				

7.4.2 Sample Labels

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

- company name and site,

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

7.4.3 Chain-of-Custody Record

To maintain a record of sample collection, a COC record will be filled out documenting the collection and shipment of samples and receipt by the laboratory. Sample COC procedures require that the possession and handling of the sample from the moment of its collection through analysis be documented by written record. The record must clearly reflect the movement of the sample through the COC to ensure the sample has been positively controlled and has not been tampered with in any way. Each time samples are transferred, the signatures of the person relinquishing and receiving the samples, as well as the date and time of transfer, will be documented.

7.4.4 Transfer of Custody and Shipment

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

All samples will be shipped by courier, such as Federal Express, to the analytical laboratory. Upon receipt of samples at the laboratory, the receiver will complete the transfer by dating and signing the COC record. If shipped by commercial courier, the air bill number and shipping data will be transcribed to the COC in the appropriate signature/date block. A copy of the air bill is to be kept with the field copy of the COC form to reflect specific shipping information.

7.5 DOCUMENTATION PROCEDURES

All documentation must be legible and completed in indelible ink. Corrections must be marked with a single line, dated, and initialed. Serialized documents are not to be destroyed or discarded, even if illegible or inaccurate. Voided entries must be maintained within project files. Every line in the logbook should

contain text or have notations that the line is intentionally not being used. Text should be continuous, with no breaks between topics. Empty lines should have a diagonal line drawn across them and be signed and dated.

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

7.5.1 Logbooks

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

7.6 QUALITY CONTROL FOR FIELD MEASUREMENTS

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

Measurement data may be generated during field activities (1) to make qualitative organic vapor screening measurements from samples before disposal segregation or health and safety monitoring using a PID or FID; (2) to determine gross levels of contaminant concentrations; and (3) to locate, and determine the elevation of sampling locations.

Field measurement instruments will be calibrated according to manufacturers' specifications before and after each field use, or as otherwise required. Where necessary, instruments will be calibrated each day during field use, and calibration information will be documented on calibration log sheets or in logbooks.

Information to be recorded includes date, operator, and calibration standards (concentration, manufacturer, lot number, and expiration date). Field measurements are considered valid provided that:

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

7.7 ANALYTICAL DATA REPORTING, VERIFICATION, AND VALIDATION

7.7.1 Laboratory Data Verification

All data collected during the project will be internally verified by reviewing the data packages for method QC compliance including calibration frequency and acceptance criteria, method blank analysis, and matrix spike analysis. Data will also be reviewed to ensure that holding time and turn-around time requirements are met and that all requested analyses have been performed and reported.

7.7.2 Laboratory Deliverables

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

7.7.3 Laboratory Data Validation

Analytical results for samples that are to be used to support risk assessments and decision documents should be validated. Analyses performed to provide information for engineering purposes only (i.e., total organic carbon and biochemical and chemical oxygen demand analyses performed for groundwater modeling or feasibility studies) generally do not require formal data validation. The data validation process is two fold. First, all sample data packages or sample delivery groups (SDGs) are validated based on results of the laboratory analysis and associated laboratory QA/QC. After all data packages or SDGs

are validated, environmental sample results may be further qualified based on the results of associated field QC samples (trip blanks, equipment rinsates, with ASTM Type II source water or organic free water). This entails evaluating field QC samples and assessing contamination that may have been introduced to environmental samples during collection and shipment.

Data Validation Reports (DVRs) for all validated data packages or SDGs shall be provided as a result of the validation process. DVRs shall include data validation notes or checklists and a copy of corrected laboratory Form Is that identify qualification applied by the validator during both phases of the validation process. DVRs must specify laboratory QC samples or analyses (i.e., method blanks, continuing calibrations, etc.) associated with environmental samples in each SDG. DVRs must clearly indicate the reasons for all qualification of data and provide detailed rationale for all decisions involving professional judgment. Data validation deliverables will include notes and checklists and a copy of corrected laboratory Form Is that identify qualifications applied by the validator. Data validation deliverables will clearly indicate the reasons for all qualifications of data and provide detailed rationale for all decisions involving professional judgment.

7.8 PERFORMANCE AND SYSTEM AUDITS

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

8.0 REPORTING REQUIREMENTS

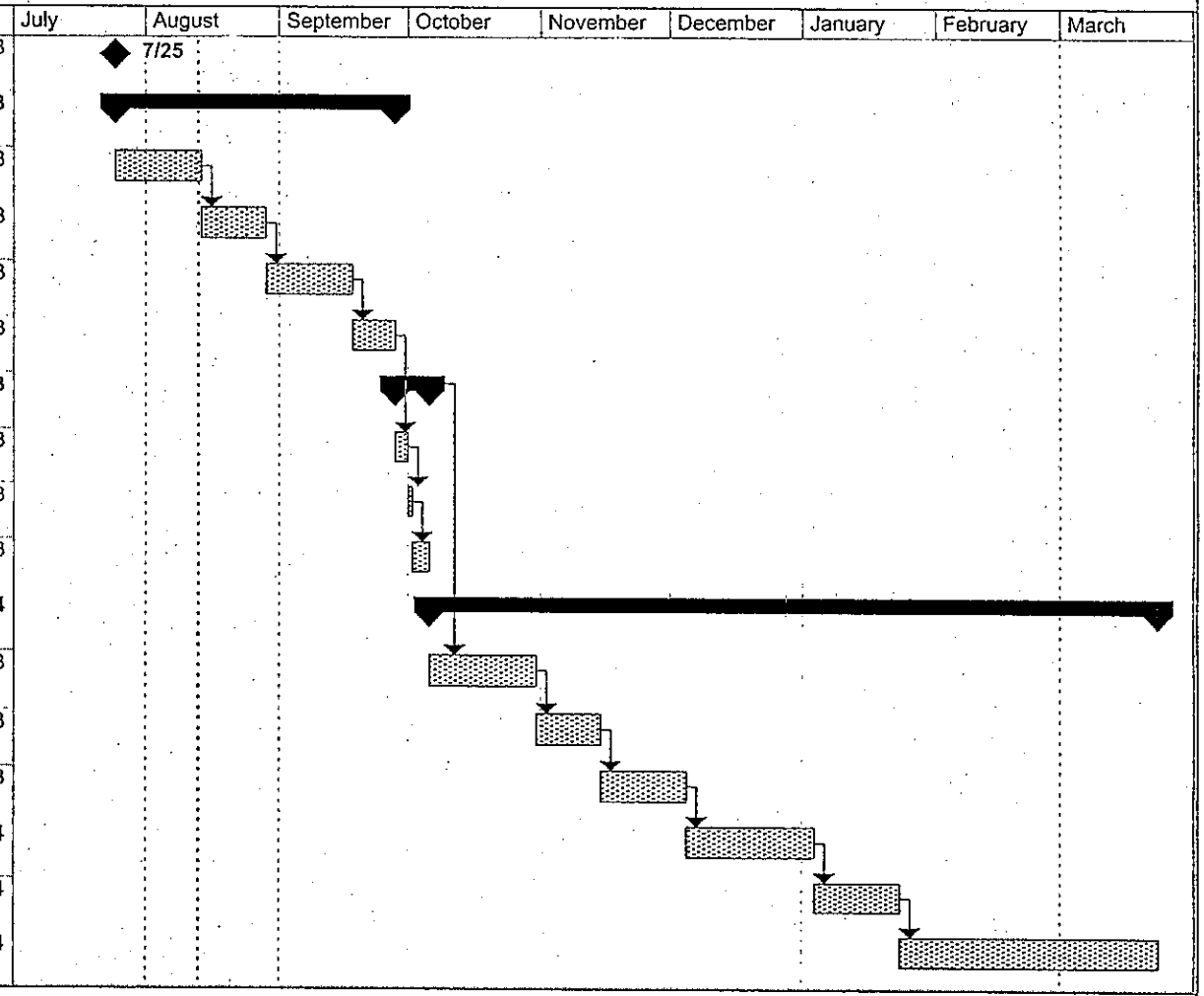
This section contains information on the reporting requirements for the investigation.

8.1 SCHEDULE

A schedule is shown on Figure 8-1 listing fieldwork, data analysis and review, data management, and report preparation.

Interim Removal Activities at the Fire Training Area Hunter Army Airfield, Georgia

ID	Task Name	Start	Finish
1	Notice to Proceed	Fri 7/25/03	Fri 7/25/03
2	**Removal Action Work Plan**	**Fri 7/25/03**	**Sat 9/27/03**
3	Draft Work Plan Addendum	Fri 7/25/03	Wed 8/13/03
4	Review Work Plan Addendum	Thu 8/14/03	Thu 8/28/03
5	Final Work Plan Addendum	Fri 8/29/03	Wed 9/17/03
6	Review Final Work Plan Addendum	Thu 9/18/03	Sat 9/27/03
7	**Field Work**	**Sun 9/28/03**	**Sun 10/5/03**
8	Monitor Well Removal	Sun 9/28/03	Tue 9/30/03
9	Remove Skimmer	Wed 10/1/03	Wed 10/1/03
10	Install Downgradient Monitor Well	Thu 10/2/03	Sun 10/5/03
11	**Closure Status Report**	**Mon 10/6/03**	**Tue 3/23/04**
12	Draft Closure Status Report	Mon 10/6/03	Thu 10/30/03
13	Review Closure Status Report	Fri 10/31/03	Fri 11/14/03
14	Final Closure Status Report	Sat 11/15/03	Thu 12/4/03
15	Review Final Closure Status Report	Fri 12/5/03	Sat 1/3/04
16	Corrected Final Closure Status Report	Sun 1/4/04	Fri 1/23/04
17	Review Corrected Final Closure Status Report	Sat 1/24/04	Tue 3/23/04



Project: IRA at Fire Training Area
Date: Wed 8/13/03

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

Figure 8-1 Project Schedule

8.2 DRAFT AND FINAL INVESTIGATION REPORTS

STEP will prepare a draft Addendum to the CSR documenting the monitoring well removal and replacement, the soil removal action, and the installation of the new monitoring well. The report will summarize the activities conducted during the IRA, and present data in the form of tables and figures. The draft report will be reviewed by the Corp of Engineers and DPW personnel. After comments are incorporated, a final addendum CSR report will be prepared and submitted to the appropriate state and Federal regulators. Upon completion of the final addendum CSR report, copies of the final report will be made available to USACE Savannah District and Fort Stewart/HAAF DPW in both electronic and written format.

9.0 REFERENCES

LAW, May 2002. *Revised Final Compliance Status Report, Former Fire Training Area at Hunter Army Airfield.*

Environmental Science & Engineering, June 1993. Final Significance of Contamination Report: Hunter Army Airfield Fire Training Area, Fort Stewart, Savannah, Georgia.

Environmental Science & Engineering, Inc., May 1994. *Closure Plan for Hunter Army Airfield Fire Training Area.*

Omega Environmental Services and Geosciences, Inc., December 1998. *Soil Remedial Action Report.*

Final
Accident Prevention Plan
Including the Site Safety and Health Plan

for

Interim Removal Activities at Former Fire Training Facility
Hunter Army Airfield
Savannah, Georgia

September 2003

Prepared For:

U.S. Army Corps of Engineers
Savannah District
Under Contract DACA01-03-D-0010
Delivery Order No. CV02

Prepared By:

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

SIGNATURE PAGE

Final
Accident Prevention Plan
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Interim Removal Activities at Former Fire Training Facility
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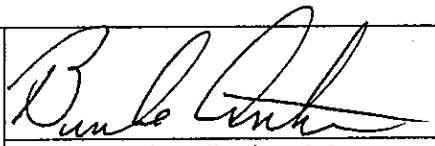
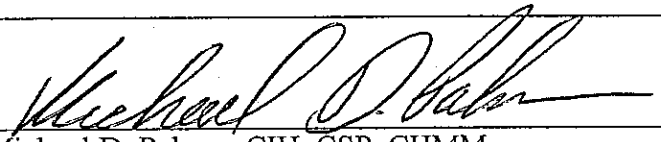
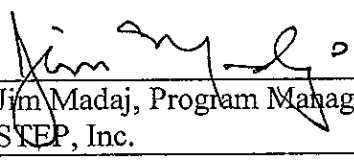
Savannah, Georgia

Contract No. DACA01-03-D-0010
Delivery Order No. CV02

September 2003

Prepared By:	
	Burke Arthur, Project Manager STEP, Inc. (865) 481-7837

Plan Approval:	
	Michael D. Palmer, CIH, CSP, CHMM PSC Safety and Health Services (865) 777-1401

Plan Concurrence:	
	Jim Madaj, Program Manager STEP, Inc. (865) 481-7837

ACCIDENT PREVENTION PLAN
Interim Removal Activities at Former Fire Training Facility
Hunter Army Airfield
Savannah, Georgia
September 2003

PURPOSE AND SCOPE

This Accident Prevention Plan (APP) will serve, in essence, as a safety and health policy and program document for this project. This plan will address the job-specific hazards associated with this project and also any unusual or unique aspects of the project. To avoid duplication, the USACE EM 385-1-1 minimum basic requirements of an APP that are not specifically addressed in this APP are included in the a project Site Safety and Health Plan (SSHP).

1. SIGNATURE SHEET

The signature page is included on page 1 of this document.

2. BACKGROUND INFORMATION

2 a. Contractor: Solutions To Environmental Problems, Inc. (STEP)

2 b. Contract Number: DACA01-03-D-0010, Delivery Order No. CV02

2 c. Project Name: Interim Removal Activities at Former Fire Training Facility

2 d. Project Description: See Section 4.0 of the Work Plan for description of project and scope of work. Figure 4-1 of the work plan contains a site map.

2 e. Accident Experience: STEP has experienced a significant downward trend in our accident experience over the past three years as of September 2003 has an EMR of 0.92.

2 f. List of Phases of Work and Activity Hazard Analysis: Types of hazards are listed in the in Section 2 of the Site Safety and Health Plan (SSHP).

3. STATEMENT OF SAFETY AND HEALTH POLICY

STEP Corporation's commitment to excellence in the areas of health and safety performance is consistent with the company's goal of being acknowledged as being an industry leader. As such, STEP is committed to the following principles.

- **Decision-making:** STEP will make health and safety concerns an integral part of corporate decision-making. All strategic and operational decision-making will take into account health

and safety implications.

- **Compliance**: STEP will comply with all applicable health and safety laws and regulations. Health and safety programs will be established and maintained. Audits will be conducted to assess compliance with laws and regulations as well as these principles.

- **Communication with Employees:** STEP will promote among its employees an individual and collective sense of responsibility for the protection of health and safety.

- **Subcontractor Selection:** STEP will preferentially select subcontractors with excellent safety programs and who demonstrate a commitment to these principles of worker safety and health.

- **Measurement of Performance:** STEP will develop a means to measure both current and future health and safety performance in meeting these principles.

- **Risk management:** STEP will constantly strive to identify, evaluate, and control risks in the work place that present a potential loss due to personal injury, property damage, or harm to the environment.

- **Responsibility:** All STEP employees are empowered to take the necessary means to protect their personal safety, as well as that of their coworkers. STEP employees are responsible for complying with safety requirements, as well as bringing safety concerns to the attention of management.

STEP believes that all work-related accidents are preventable. The safety of our workers is the same priority as production and client satisfaction.

4. RESPONSIBILITIES AND LINES OF AUTHORITY

4 a. Personnel Responsible for Safety: See the SSHP Section 3 for Safety Program Administration for this project. Key corporate and project personnel resumes are included in Appendix F of the SSHP.

4 b. Lines of Authority: See the SSHP Section 3 for Lines of Authority.

5. SUBCONTRACTORS AND SUPPLIERS

5 a. Identification of Subcontractors: Figure 1-1 in the Work Plan contains an organizational chart showing subcontractors required for completion of this project.

5 b. Subcontractor Coordination and Control: Section 3.2 of the SSHP contains a discussion of coordination and control of subcontractors.

5 c. Safety Responsibilities of Subcontractors: See Section 1.1 of the SSHP for a discussion of the safety responsibilities of subcontractors and suppliers.

6. TRAINING

6 a. Safety Training: See SSHP Section 4 for descriptions of the safety orientation, safety meetings, and safety training requirements associated with this project. Employee training certifications are contained in Appendix C of the SSHP.

6 b. Mandatory Safety Training: See Section 4 of the SSHP.

6 c. Emergency Response Training: See Section 4 of the SSHP.

6 d. Supervisor and Employee Safety Meetings: See Section 4.2 of the SSHP for a description of requirements for the Site Orientation Briefing, Pre-Work Briefings, and Daily Safety Meetings.

7. SAFETY AND HEALTH INSPECTIONS

7 a. Safety Inspection Personnel: The site safety and health officer (SSHO) will conduct weekly site and daily equipment and drill rig inspections. These inspections will be documented using the inspection forms included in Appendix A of the SSHP.

7 b. External Inspections/Certifications: The Corporate Safety and Health Manager may make announced or unannounced site visits. The corporate Safety and Health Manager also performs a quarterly review of all projects to ensure the proper documentation and follow-up of safety meetings, inspections, and briefings.

8. SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

8 a. Safety Goals: STEP's Project Safety Goal is to complete the project and all associated activities with no recordable accidents or illnesses and no First Aid incidents. All accident records are maintained by the STEP's Human Resources Department.

8 b. Safety Incentive Programs: STEP does not currently have a safety incentive program in place.

8 c. Policies and Procedures for Noncompliance: Noncompliance with safety and health requirements will be corrected immediately as designated by on-site supervisory personnel. Documentation will be made in the logbook. The Site Manager or SSHO will report serious, noncompliant, personnel to the immediate supervisor. The supervisor shall counsel the employee. STEP complies with all federal, state, and local safety and health regulations. STEP also has instituted internal requirements to help us reduce the potential for accidents or illnesses. All employees are expected to follow the safe practices, to take responsibility for

their own safety, and respect the safety of others. STEP's safety management approach attempts to motivate employees to work safely, rather than punishing them for unsafe behaviors, but there may be instances where disciplinary action may be necessary.

Any personnel not abiding by regulatory or internal safety rules or policies will be subject to progressive discipline. The general approach to progressive discipline includes the following steps.

- First Offense - Documented verbal warning
- Second Offense - Written warning,
- Third Offense – Three days suspension without pay
- Fourth Offense – Termination

The discipline will be documented by the Supervisor, and a notice will be placed in the individual's personnel record.

Depending on the nature, severity, or frequency of safety violations, and at STEP's sole discretion, individual or multiple steps in this progressive discipline approach may be bypassed, with potential actions up to or including termination on the first offense.

8 d. Supervisory Accountability for Safety: See Section 3 of the SSHP.

9. ACCIDENT REPORTING

9 a. Exposure/Man-hours: Mr. Burke Arthur (STEP) will provide monthly reporting of man-hours and exposure data per contract requirements.

9 b. Accident Investigations, Reports, and Logs: See Section 11 of the SSHP for Accident Investigation reporting. Accident investigation reports and logs are included in Appendix A of the SSHP.

9 c. Accident Notification: See SSHP Section 11 and Appendix A.

10. MEDICAL SUPPORT

Section 11 of the SSHP contains procedures for Emergency Response efforts, including the requirements for Medical Support. Section 11.2 contains the emergency phone numbers necessary for medical support and Appendix E contains a map to the hospital.

11. PERSONAL PROTECTIVE EQUIPMENT

Section 5 of the SSHP details the procedures for who should use personal protective equipment (PPE), and when and how this equipment should be used.

12. PLANS REQUIRED BY THE SAFETY MANUAL

12 a. Hazard Communication Program: Hazard Communication is discussed in Section 8.10 of the SSHP.

12 b. Emergency Plans: Emergency Plans are detailed in Section 11 of the SSHP.

12 c. Layout Plans: See Appendix D of the SSHP.

12 d. Respiratory Protection Plan: Table 4-1 of the SSHP requires respiratory protection training for work conducted inside a controlled area. At the beginning of the project, respiratory protection is not required. If an upgrade in PPE, involving respiratory protection, is required, the SSHO will stop work and notify the Site Manager and the Safety and Health Manger.

12 e. Health Hazard Control Programs: See Table 2-2 and Section 8 of the SSHP for identification of identification of health hazards.

12 f. Lead Abatement Plan: Not applicable to this project.

12 g. Asbestos Abatement Plan: Not applicable to this project.

12 h. Abrasive Blasting: Not applicable to this project.

12 i. Confined Space: Not applicable to this project.

12 j. Hazardous Energy Control Plan: See Section 8.8 of the SSHP for lockout/tagout safety precautions. Overhead line distances will be checked prior to raising loads overhead. Dig permits will be obtained prior to any excavations. However, no lockout/tagout activities are anticipated at this time that would require development of a Hazardous Energy Control Plan.

12 k. Critical Lift Procedures: Not applicable to this project.

12 l. Contingency Plan for Severe Weather:

Site personnel shall follow standard safety guidelines for Severe Weather. These include but are not limited to:

- Use a weather radio in remote areas or, set portable or vehicle radio to a local station during peak tornado and storm seasons and check every 1-2 hours for weather conditions.
- Shut down operations and lower any elevated parts to heavy equipment when lightning discharge is within 3 - 5 miles. The distance used is dependent on the speed of the approaching storm.

- Inspect stream and riverbanks for flood potential and stability and secure equipment and personnel at a safe distance.
- Notify local authorities that you are on site and request notification if severe weather conditions arise. Authorities may include: Installation POC, USACE construction and real estate field offices, fire, and police services.

12 m. Access and Haul Road Plan: Not applicable to this project

12 n. Demolition Plan: Not applicable to this project

12 o. Emergency Rescue: Not applicable to this project

12 p. Underground Construction Fire Prevention and Protection Plan: Not applicable to this project

12 q. Compressed Air Plan: Not applicable to this project

12 r. Formwork and Shoring Erection and Removal Plans: Not applicable to this project

12 s. Lift Slab Plans: Not applicable to this project

12 t. SHP and SSHP: A Site Safety and Health Plan is included in Attachment I of the AAP.

12 u. Blasting Plan: Not applicable to this project.

12 v. Diving Plan: Not applicable to this project.

12 w. Alcohol and Drug Abuse Prevention Plan: STEP, Inc. participates in a Drug-Free Workplace Program, which is certified by the State of Tennessee. No alcoholic beverages or illegal substances may be used during work hours, stored on the person or in company vehicles. Personnel who appear to be under the influence of these substances at any time during the work period shall not operate any motorized tools, equipment or vehicles. Personnel who appear to be under the influence of over-the-counter drugs or medications (antihistamines, allergy medication, etc.) that impair their ability to function (fitness for duty such as operate equipment or vehicles), shall be prevented from doing so. The on-site manager (SSHO or alternate) shall contact the STEP Project Manager and Human Resources Manager for guidance in accordance with the STEP Alcohol and Drug Abuse Policy.

13. ADDITONAL INFORMATION

Additional safety and health requirements are included in the SSHP.

ATTACHMENT I

SITE SAFTEY AND HEALTH PLAN

Final
Site Safety and Health Plan for the Interim Removal Activities at the Fire Training Area Hunter Army Airfield, Georgia

September 2003

Submitted to:
U.S. Army Corps of Engineers
Savannah District
Contract No. DACA01-03-D-0010
Delivery Order No. CV01

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

TABLE OF CONTENTS

List of Tables

Appendixes

ACRONYMS AND ABBREVIATIONS

ACGIH	American Council of Government Industrial Hygienists
BTEX	benzene, toluene, ethylbenzene, and xylene
CFR	*Code of Federal Regulations*
CHMM	Certified Hazardous Materials Manager
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
CSP	Certified Safety Professional
dBA	A-weighted decibels (dBA)
ES&H	environmental safety and health
eV	electron volt
EZ	exclusion zone
FID	flame ionization detector
FID	photoionization detector
FP	flash point
GFCI	ground fault circuit interrupter
HAAF	Hunter Army Airfield
HAZWOPER	hazardous waste operations and emergency response
HTRW	hazardous, toxic, and radioactive waste
IDLH	immediately dangerous to life or health
IP	ionization potential
mm	millimeter
mph	miles per hour
MSDS	material safety data sheet
msl	mean sea level
NA	not applicable
NIOSH	National Institute of Occupational Safety and Health
NRR	noise reduction ration
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PT	physical training
PVC	polyvinyl chloride
S&H	safety and health
SSHO	site safety and health officer
SSHP	site safety and health plan
STEL	short-term exposure limit
STEP	Solutions To Environmental Problems, Inc.
TLV	threshold limit value
TM	Task Manager
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
VOC	volatile organic compound
VP	vapor pressure

1. INTRODUCTION

1.1 GENERAL

Solutions To Environmental Problems, Inc. (STEP) conducts activities in accordance with its corporate environmental safety and health (ES&H) program that is intended to ensure safe operation and regulatory compliance during all fieldwork. STEP is committed to compliant operation under provisions of this program. The corporate policy states, "It is the policy of STEP to take every reasonable precaution to protect the health and safety of our employees, the public, and the environment."

STEP's ES&H program, which is contained in *Solutions To Environmental Problems (STEP), Safety and Health Manual* (STEP, August 2001), hereinafter referred to as the STEP S&H Manual, together with site safety and health plans (SSHPs), present the requirements for safely performing fieldwork. This SSHP sets forth the basic procedures required to protect STEP and subcontractor personnel involved in the field phase of this project.

This plan represents a good-faith effort to identify, evaluate, and prescribe control for the hazards that will be posed by this work. The Site Safety and Health Officer (SSHO) will perform daily safety inspections to verify that the controls in this plan are appropriate and sufficient and will revise these controls as necessary to ensure that the work is performed safety. Revisions to the SSHP will be documented. Revisions to the SSHP that result in decreasing or eliminating a hazard control must first be approved by the STEP health and safety representative. STEP subcontractors will be informed of the requirements of this plan and will be provided with copies of, or unrestricted access to copies of this plan. STEP subcontractors will be required to comply with the requirements of this plan. This plan does not relieve subcontractors of the regulatory requirement to provide a safe workplace, and STEP subcontractors will be required to supplement the requirements of this plan, as necessary, to ensure that their employees perform their specific tasks safely.

This document is designed to satisfy the requirements of ER 385-1-92, *Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities* [U.S. Army Corps of Engineers (USACE), September 2000]; the requirements of EM-385-1-1, *Safety and Health Requirements Manual* (USACE, September 1996); relevant occupational Safety and Health Administration (OSHA) regulations; and the STEP S&H Manual.

This SSHP is included as a stand-alone portion of the project work plan. In cases in which required information is contained in another portion of the work plan, the information will be referenced rather than repeated in this SSHP.

The scope of the project includes the removal of an existing monitoring well and the installation of a new well at Hunter Army Airfield (HAAF), Georgia. In addition, the project involves the disconnection and removal of a belt skimmer.

Specific on-site tasks to be performed by STEP and its subcontractor include:

- removing the existing monitoring well at the Former Fire Training Area;
- disposing the well screen and casing and the surface pad and bollards;
- excavating an area approximately 15 feet x 15 feet, approximately 8 feet in depth;
- sampling excavated soil;
- collecting five soil samples from the completed excavation;

- installing a 4-inch polyvinyl chloride (PVC) monitoring well with pre-packaged screen;
- backfilling the excavation with gravel and soil;
- determining the depth of any free product;
- disconnecting the existing belt skimmer at the Fire Training Area from electrical utilities and effluent discharge lines;
- moving the skimmer to the 728 fenced area;
- installing a downgradient monitoring well within 25 feet of the excavation; and
- developing the well and obtaining one groundwater sample, submitted for testing.

The greatest hazards posed by the planned tasks are those associated with the heavy equipment (such as backhoes and drill rigs). Based on previous sampling results, there is also a potential for overexposure to site contaminants; however, this potential will be readily controllable with standard operating procedures and personal protective equipment (PPE).

This project will be performed in Level D PPE unless one of several action levels specified in the plan is exceeded, or the potential for increased risk becomes apparent during the field activities. Protective procedures, including protective clothing, will be upgraded as necessary by the SSHO based on established action levels or judgment.

Site visitors will not be allowed inside areas controlled by STEP without the specific approval of the SSHO and STEP Field Manager. Site visitors must meet all regulatory and site health and safety requirements (e.g., training, medical surveillance) to be considered for entry into exclusion or contamination-reduction zones. Site visitors are requested to contact the STEP Project Manager or Field Manager prior to visiting.

1.2 SITE DESCRIPTION

HAAF is located in the southwest portion of the city of Savannah, Chatham County, Georgia. The facility is bounded on the north by Savannah, on the east and south by residential and light commercial areas, and on the west by the Little Ogeechee River. Presently, HAAF serves as an aircraft support base for the U.S. Coast Guard and a U.S. Army military base, Fort Stewart Military Reservation, which is located approximately 50 miles to the west.

The former Fire Training Area was located in the northwestern portion of HAAF, approximately 800 feet from the control tower on a grassy cleared area measuring approximately 400 feet by 200 feet. The Fire Training Area featured a 6,400 square foot, diked, gravel-covered concrete pad upon which a simulated aircraft was constructed. Fuels used in the training exercises at the Fire Training Area were stored in an aboveground, steel storage tank with a capacity of approximately 18,000 gallons. The tank measured 27 feet by 9 feet, and was installed with the long axis oriented horizontally. The tank rested on three concrete supports and was located approximately 112 feet due north of the training pad. The tank was surrounded on all sides by a 2.5 foot earthen berm. Fuel used in fire training exercises was pumped through an underground line directly to the simulated aircraft on the fire training pad. The fuel line was approximately 142 feet long.

The former Fire Training Area is bounded on the northwest and south by drainage ditches, on the east by the airfield pavement, and on the southwest by wooded land. Topographic relief in the vicinity of the site is approximately 21 feet. Elevations at the site range from 35 feet above mean sea level (msl) at the fire training pad to 14 feet above msl in the northern drainage ditch. The topography of the Fire Training Area averages approximately 30 feet above msl and slopes gently to the west toward the Springfield Canal. The canal flows southwest before emptying into the Little Ogeechee River floodplain.

The Fire Training Area was used for training of fire fighters based at HAAF until 1991. Fuel utilized for training exercises included mostly water-contaminated fuel (JP-4) and diesel fuel. No evidence or documentation exists to indicate that solvents were used. During the training exercises, fuel was pumped onto the surface of the simulated aircraft and ignited. The fire was extinguished with water or foam. A containment pad constructed with concrete curbs was used to contain the water and foams, but was not entirely successful. As a result, fluid would occasionally spill onto the surrounding soil.

Previous remedial activities at the Fire Training Area revealed some level of contamination in the soil. The detected or known Fire Training Area contaminants include both organic and inorganic Georgia Hazardous Site Response Act regulated constituents, namely metals, volatile organic compounds (VOCs), and semivolatile organic compounds.

2. HAZARD/RISK ANALYSIS

The purpose of the site task hazard analysis is to identify and assess potential hazards that could be encountered by site personnel and to prescribe required controls. Table 2-1 is a checklist of common hazards that could result from this type of project. It indicates whether a particular major type of hazard is or could possibly be present. In general, the site tasks will consist of activities required to excavate soil and install a monitoring well. Overexposure to site contaminants appears to be very unlikely.

Table 2-1 Hazards Inventory

Yes	No	Hazard
X		Biological hazards (wasps, bees, snakes, poison ivy, ticks)
	X	Confined-space entry (no confined spaces are present)
	X	Drowning (no work near water)
X		Electrical shock (skimmer, utilities)
	X	Excavation entry
X		Exposure to chemicals (BTEX)
	X	Exposure to boiling water
X		Fire (fuels and contaminants)
	X	Unexploded ordnance (no reported use or sightings; the site has been subject to extensive excavation)
X		Heavy equipment (drill rig and backhoe)
X		Noise
	X	Radiation or radioactive contamination (none present)
X		Temperature extremes (possible)

Site tasks present several possible physical hazards, which include heavy equipment, falling equipment or other objects, moving equipment, vehicle accidents, inclement weather, and electrocution (caused by contact with energized circuits of the skimmer system). There is no record or other indication of unexploded ordnance (UXO) use or disposal in this area, so there does not appear to be any potential to

encounter UXO. If additional tasks or significant hazards are encountered during the work, this document will be modified by addendum or field change order to include the additional information. Any changes to the SSHP will be submitted to the Project Manager/Task Manager (PM/TM) for approval.

2.1 TASK-SPECIFIC HAZARDS ANALYSIS

Table 2-2 presents task-specific hazards, relevant hazard controls, and required monitoring, if appropriate, for all of the planned site tasks.

Table 2-2 Hazards Analysis

Safety and Health Hazards	Controls	Monitoring
Excavation and Removal of Monitoring Well		
General safety hazards	• Level D modified PPE, buddy system, site-specific training, HAZWOPER training • Contractor will perform this work in accordance with equipment specific standard safe operating procedures • Site is restricted to authorized personnel • At least two first aid/CPR trained individuals on-site	Daily site inspections
Electrical	• Assure grounding will be utilized for all temporary wiring • GFCIs will be utilized for portable hand tools	
Excavation	• Only qualified and experienced personnel will operate heavy equipment. • Workers will be kept at least 10 feet away from heavy equipment during operation. • Barricades/flagging will be erected 6' from the edge of the excavation. • All excavation activities will be conducted in accordance with EM 385-1-1, Section 25.	Daily monitoring
Biological hazards (bees, ticks, wasps, snakes, poison ivy)	• Boots, work clothes, taped pant legs as necessary • Insect repellant as necessary	Visual survey
Mosquito borne diseases (e.g., West Nile Virus, Encephalitis)	• Use commercially available insect repellent containing DEET • Wear long-sleeved shirts and pants	Visual survey
Exposure to chemicals	• Level D modified PPE. Nitrile gloves or equivalent (rated good or excellent for gasoline resistance) at least 4-mil thick will be worn when contact with contaminated soil is possible. Two pairs of gloves will be worn if chemical-resistant clothing is worn. • MSDS labeling and training for any chemicals brought on-site • Medical clearance for hazardous waste work • Wash face and hands upon leaving the exclusion zone. • Periodic area and breathing zone monitoring of contaminant levels. • Employee briefings. • Medical clearance, if respirators are used • Current fit tests, if respirators used	Daily site inspections

Safety and Health Hazards	Controls	Monitoring
Excavation and Removal of Monitoring Well (Continued)		
Temperature extremes	• Administrative controls (Section 8)	Temperature measurements; heart rate monitoring per Section 8
Noise	• Hearing protection within 25 feet of rig, unless site-specific monitoring indicates noise <85 dBA • See Section 7.2 of SSHP	Daily site safety inspections
Post specific	• All personnel must have a government identification card or temporary vehicle permit • All drivers must have current drivers license • All vehicles must have proof of insurance • Troops on PT have right-of-way. Speed limit 10 miles per hour when near troops on PT	Daily safety inspections
Installation of New Monitoring Well		
General safety hazards (rotating machinery, suspended loads, moving equipment, slips, falls)	• Level D modified PPE (Section 5) plus hardhat, buddy system • No employees under lifted loads. EZ around rig; only necessary and experienced personnel within exclusion zone • HAZWOPER training; standard procedures (Section 8.13) • Subcontractors will perform drilling per their standard operating procedures	Daily site safety inspections Weekly drill rig inspections
Noise	• Hearing protection within 25 feet of rig, unless site-specific monitoring indicates noise <85 dBA	Daily site safety inspections
Fire (fuels)	• Fire extinguishers (serviced annually and inspected monthly) will be present in all fuel use areas • Fuel stored in safety cans with flame arresters • Fire extinguisher rated ≥20B within 50 feet from flammables storage • No ignition sources in fuel storage areas • Fuel storage areas marked with "No Smoking or Open Flame" signs • Bonding (metal to metal contact) during pouring • Gasoline powered equipment shut down during fueling	Daily site safety inspections
Exposure to chemicals (Table 2-3)	• PPE (Level D modified) Nitrile gloves or equivalent (rated good or excellent for gasoline resistance) at least 4 mil thick will be worn. When encountering potentially contaminated soil, gloves will be changed every two hours. Face shields will be worn if splashing is a possibility • Medical clearance for hazardous waste work • Wash face and hands upon leaving the exclusion zone • MSDS labeling and training for all chemicals brought on site	FID or equivalent for VOCs and colormetric sampling tubes for specific gases/vapors, such as benzene
Temperature extremes	• Administrative controls (Section 8.14)	Temperature measurements: heart rate/temperature monitoring per Section 8
Water hazards	• No personnel or equipment will be allowed within 30 feet of drainage ditches	Daily safety inspections

Safety and Health Hazards	Controls	Monitoring
Installation of New Monitoring Well (continued)		
Biological hazards (bees, ticks, wasps snakes, poison ivy)	• PPE (boots, work clothes, tape pant legs as needed) • Insect repellant, as necessary • Snake chaps for work in areas with undergrowth	Visual survey
Mosquito borne diseases (e.g., West Nile Virus, Encephalitis)	• Use commercially available insect repellent containing DEET • Wear long-sleeved shirts and pants	Visual survey
Electric shock	• Identification and clearance of overhead and underground utilities (Section 8)	Visual inspection of all work areas Permits/clearance
Post-specific issues	• All personnel must have a government identification card or a temporary vehicle permit • All drivers must have current drivers license • All vehicles must have proof of insurance • Speed limit 30 mph except where posted otherwise • Troops on PT have right-of-way • Speed limit 10 mph when near troops on PT	Daily safety inspections
Soil Sampling		
General safety hazards (moving equipment, slips, falls)	• Level D modified PPE (Section 5), buddy system • Standard procedures (Section 8) • HAZWOPER training	Daily site safety inspections
Noise	• None	None
Fire(fuel)	• Fire extinguishers (serviced annually and inspected monthly) present in all fuel use areas • Fuel stored in safety cans with flame arresters • Fire extinguisher rated ≥20B feet to 75 feet from flammables storage • Flammables cabinet for indoor storage of ≥25 gallons • No ignition sources in fuel storage areas • Fuel storage areas marked with "No Smoking or Open Flame" signs • Bonding (metal to metal contact) during pouring • Gasoline powered equipment shut down during fueling	Daily site safety inspections

Safety and Health Hazards	Controls	Monitoring
Soil Sampling (continued)		
Exposure to chemicals (Table 2-3)	• PPE (Level D modified). Nitrile gloves or equivalent (rated good or excellent for gasoline resistance) at least 4 mil thick will be worn • Gloves will be changed immediately following contact with a liquid fuel residue • Wash face and hands upon leaving the EZ • Medical clearance for hazardous waste work • Eyewash within 100 feet and a pre-prepared, commercially-made flush bottle within 10 feet to 15 feet when pouring corrosive sample preservatives or adding water to pre-preserved sample containers. MSDS labeling and training for all chemicals brought on site	Daily site safety inspection FID monitoring if prior monitoring during soil boring indicated a potential for exposure
Temperature extremes	• Administrative controls (Section 8)	Temperature measurements; heart rate monitoring as described in Section 8
Biological hazards (bees, ticks, wasps snakes, poison ivy)	• PPE (boots, work clothes, tape pant legs as needed) • Insect repellant, as necessary • Snake chaps for work in areas with undergrowth	Visual survey
Mosquito borne diseases (e.g., West Nile Virus, Encephalitis)	• Use commercially available insect repellent containing DEET • Wear long-sleeved shirts and pants	Visual survey
Post specific issues	• All personnel must have a government identification card or a temporary vehicle permit • All drivers must have current drivers license • All vehicles must have proof of insurance • Speed limit 30 mph except where posted otherwise • Troops on PT have right-of-way • Speed limit 10 mph when near troops on PT	Daily safety inspections
Installation of Downgradient Monitoring Well		
General equipment decontamination hazards (slips, falls, equipment handling)	• Level D modified PPE (Section 5) • No employees under elevated loads; exclusion area around rig; two functional kill switches or a positive action switch; functional backup alarm; drill rig operating manual on-site • HAZWOPER training	Daily site safety inspections
Steam/hot water (Decon)	• Level D+ PPE including face shield, heavy duty PVC or similar gloves • Saranax suit, rain suit, or splash apron optional (when operating steam washer)	Daily site safety inspections

Safety and Health Hazards	Controls	Monitoring
Installation of Downgradient Monitoring Well (continued)		
Fire(fuel)	• Fire extinguishers (serviced annually and inspected monthly) present in all fuel use areas • Fuel stored in safety cans with flame arresters • Fire extinguisher rated ≥20B feet to 50 feet from flammables storage • No ignition sources in fuel storage areas • Fuel storage areas marked with "No Smoking or Open Flame" signs • Bonding (metal to metal contact) during pouring • Gasoline powered equipment shut down during fueling	Daily site safety inspections
Exposure to chemicals (Table 2-3)	• Level D modified PPE including nitrile or PVC gloves for contact with potentially contaminated materials • Medical clearance for hazardous waste work • MSDS labeling and training for chemicals brought on site • Wash face and hands at exit from exclusion zone	Daily site safety inspections
Temperature extremes	• Administrative controls (Section 8)	Temperature measurements; heart rate monitoring as described in Section 8
Post specific issues	• All personnel must have a government identification card or a temporary vehicle permit • All drivers must have current drivers license • All vehicles must have proof of insurance • Speed limit 30 mph except where posted otherwise • Troops on PT have right-of-way • Speed limit 10 mph when near troops on PT	Daily safety inspections

CPR = cardiopulmonary resuscitation
EZ = exclusion zone
HAZWOPER = hazardous waste operations and emergency response
mph = miles per hour
MSDS = material safety data sheet
FID = flame ionization detector
PPE = personal protective equipment
PT = physical training
PVC = polyvinyl chloride

2.2 POTENTIAL EXPOSURES

Information on the significant suspected contaminants and chemical tools that will be used for the project is contained in Table 2-3. Note that this list does not include all the contaminants that have been detected. Only those contaminants with relatively low exposure limits and that are present in relatively high concentrations have been listed in Table 2-3. If additional contaminants or chemical tools (that pose new or significantly greater hazards) are identified prior to or during site activities, additional hazards analyses will be provided as an addendum to this document.

Table 2-3 Potential Exposures

Chemical	TLV/PEL/ STEL/IDLH[a]	Properties and Potential Hazards[b]	Exposure Route(s)
Benzene (contaminant)	PEL: 1 ppm TLV: 0.5 ppm OSHA STEL: 5 ppm	• Liquid with aromatic odor; VP 75 mm, FP: 12°F; IP: 9.24 eV; flammable liquid • Carcinogen; eye and skin irritation; dizziness	Inhalation Ingestion Absorption Contact
Xylene (contaminant)	PEL: 100 ppm TLV: 100 ppm NIOSH STEL: 150 ppm	• Liquid with aromatic odor; VP 9 mm, FP: 81°F; IP: 8.44 eV; flammable liquid • Eye and skin irritation; dizziness	Inhalation Ingestion Contact
Ethylbenzene (contaminant)	TLV: 100 ppm PEL: 100 ppm	• Liquid with aromatic odor; VP: 7 mm; • FP: 55°F; IP: 8.76 eV; flammable liquid • Irritation of eyes and skin; dizziness; headache	Inhalation Ingestion Contact
Toluene	TLV: 50 ppm PEL: 200 ppm	• Liquid, colorless with sweet pungent odor; VP: 21mm; FP: 40°F; IP: 8.82 eV; flammable liquid, irritation of eyes and skin, dizziness, headache	Inhalation Ingestion Absorption
Gasoline (fuel)	TLV: 300 ppm IDLH: NA	• Liquid with aromatic odor; FP: -45° • Dizziness, eye irritation, dermatitis; flammable liquid	Inhalation Ingestion Contact
Liquinox (used for decontamination)	TLV: NA	• Aqueous liquid, odorless, nonflammable • May cause local irritation to mucus membranes	Ingestion Contact
Diesel fuel	TLV: 100 mg/m^3	• Liquid w/ aromatic odor; FP 110°F • Dizziness, eye irritation, dermatitis; combustible liquid	Inhalation Ingestion Contact

[a]From "*Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (ACGIH, 2003) and "*NIOSH Pocket Guide to Chemical Hazards*" (NIOSH, June 1997)
[b]From "*NIOSH Pocket Guide to Chemical Hazards*" (NIOSH, June 1997)

eV = electron volt
FP = flash point
IDLH = immediately dangerous to life and health
IP = ionization potential
mm = millimeter
NA = not applicable
OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
ppm = parts per million
STEL = short-term exposure limit
TLV = threshold limit value
VP = vapor pressure

3. STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This section presents the lines of authority, responsibilities, and communication procedures related to site safety and health and emergency response. It includes key STEP and subcontractor personnel. All fieldwork will be under the supervision of the STEP Field Manager. The STEP Field Manager will oversee normal and emergency work and will perform any required emergency notification. Table 3-1 identifies the individuals who will fill key roles for the project field activities.

The key personnel assigned to the field activity positions presented in Table 3-1 represent those individuals who are expected to participate in the project. Personnel availability, however, will dictate the actual roster of individuals who will perform field activities. In the event that personnel other than those presented in Table 3-1 are assigned to the project, STEP will provide the names of those individuals to the USACE, Savannah District, Project Manager prior to mobilization for fieldwork.

Table 3-1 Staff Organization

Position	Name	Telephone
Program Manager	Jim Madaj	865-481-7837
Health and Safety Manager	Mike Palmer, CSP, CIH, CHMM	865-777-1401
Project Manager	Burke Arthur	865-481-7837
Field Manager	Jeff Williams	865-481-7837
Site Safety and Health Officer	Burke Arthur	865-481-7837
Alternate SSHO	Kris Thomasson, CSP	865-777-1401

CSP = Certified Safety Professional CIH = Certified Industrial Hygienist
CHMM=Certified Hazardous Materials Manager

3.1 STEP PROGRAM MANAGER

The STEP Program Manager is the primary interface with the client and has ultimate responsibility for the project. The PM provides progress reports and addresses client questions and concerns. In addition, the PM is responsible for ensuring conformance with the STEP ES&H Program and USACE policies and procedures. Specific responsibilities of the Program Manager include the following:

- coordinating with USACE personnel,
- ensuring that project managers satisfy STEP and USACE health and safety requirements,
- ensuring that project staff implement the project SSHPs, and
- ensuring that projects have the resources necessary to operate safely.

3.2 STEP HEALTH AND SAFETY MANAGER

The STEP Health and Safety Manager manages the STEP health and safety program. This task includes establishing health and safety policies and procedures, supporting project and office activities, and verifying safe work practices and conditions. The STEP Health and Safety Manager is certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene, is certified as a safety professional by the Board of Certified Safety Professionals, and has more than 20 years of hazardous waste experience. The specific responsibilities of the Health and Safety Manager include the following:

- coordinating with USACE health and safety personnel,
- reviewing and approving SSHPs,
- approving downgrades in PPE or protective procedures, and
- interfacing with project personnel through routine communication and audit of selected projects.

3.3 STEP PROJECT MANAGER

The STEP Project Manager is responsible for overall project execution. The responsibilities of the Project Manager include the following:

- coordinating with USACE personnel (including reporting accidents and incidents to the USACE, Savannah District, Project Manager immediately and submitting written reports within 2 working days);
- ensuring implementation of the project SSHP;
- maintaining auditable project documentation of all required records;
- ensuring that a qualified SSHO is designed; and
- maintaining a current copy of the project SSHP.

3.4 STEP FIELD MANAGER

The STEP Field Manager is in charge of all STEP and subcontractor field activities associated with this project. All STEP and subcontractor personnel performing field work on this project must report to the Field Manager.

The STEP Field Manager will oversee the field activities associated with the project and will be responsible for site accessibility safety, and quality assurance. The Field Manager is responsible for enforcing the field requirements of this SSHP. Specific responsibilities of the Field Manager are the following:

- enforcing compliance with the project SSHP;
- coordinating on site operations, including subcontractor activities;
- ensuring that subcontractors follow the requirements of this SSHP;
- coordinating and controlling any emergency response actions;
- ensuring that at least two persons currently certified in first aid/cardiopulmonary resuscitation (CPR) are on site during site operations;
- performing (or ensuring) a daily safety inspection and documenting the inspection on the daily safety inspection form, and
- maintaining current copies of the project SSHP; EM 385-1-1, *Safety and Health Requirements Manual* (USACE, September 1996), and the STEP S&H Manual (STEP, August 2001) on site.

3.5 STEP SITE SAFETY AND HEALTH OFFICER

The STEP SSHO is responsible for making health and safety decisions, for specific health and safety activities, and for verifying the effectiveness of the health and safety program. The SSHO's qualifications include, at a minimum, experience with similar projects, knowledge and understanding of the project SSHP, and the ability to use required monitoring equipment. The SSHO has primary responsibility for the following:

- implementing and verifying compliance with this SSHP and reporting to the Field Manager, Project Manager, and Health and Safety Manager any deviations from anticipated conditions;
- conducting and documenting daily safety inspections;
- stopping work or upgrading protective measures (including protective clothing) if uncontrolled health and safety hazards are encountered (Indications of uncontrolled health and safety hazards include monitoring instrument readings in excess of the established action limits, encountering

liquids other that water, and soil staining suggestive of unexpectedly high concentrations of nonvolatile contaminants.);

- authorizing resumption of work following correction of any adverse conditions;
- completing the health and safety debriefing in accordance with STEP S&H Manual, Section 4.0 – Specific Safety and Health Programs, "Toolbox Safety Meetings", included in Appendix G.
- documenting deficiencies identified in the daily inspections and responsible parties, procedures, and timetables for correction;
- ensuring that site personnel have access to this plan and are aware of its provisions;
- conducting a site-specific pre-entry health and safety briefing covering potential chemical and physical hazards, safe work practices, and emergency procedures;
- maintaining on site auditable documentation of
  - Material Safety Data Sheets (MSDSs) for applicable materials used at the site (see Appendix B);
  - training for site workers and visitors;
  - calibration/maintenance of field instruments such as photoionization detectors, flame ionization detectors (FIDs), or combustible gas indicators;
  - environmental and personal exposure monitoring results;
  - notification of accidents/incidents;
  - reports of any chemical overexposure or excessive levels;
  - notification of employees of chemical exposure data; and
  - medical surveillance;
- confirming that all on-site personnel have received the training listed in the training requirements section (Section 4) of this SSHP; and
- issuing respirators, as necessary, and ensuring that all respirator users have received medical clearance.

3.6 SUBCONTRACTOR FIELD MANAGERS

The Subcontractor Field Manager will oversee the field activities of the subcontractor employees. He/she is responsible for enforcing the field requirements of this SSHP and has the following responsibilities:

- ensuring that subcontract personnel follow the requirements of the SSHP and any other applicable safety and health requirements,
- verifying that this SSHP adequately addresses the hazards and controls of the subcontracted work,
- ensuring the safe operation of subcontractor equipment,
- coordinating the on-site operations of subcontract personnel, and
- maintaining any required documentation specific to subcontract operations.

4. TRAINING

Personnel who participate in field activities associated with this project or who enter areas controlled by STEP are subject to the training requirements presented in Table 4-1. Field activities include all tasks specified in Section 2 of this plan as well as any unspecified tasks that take place within the work area. Activities such as driving or walking on paved roads, paperwork or meetings inside routinely occupied buildings, and paperwork or similar activities inside office trailers are not subject to these training requirements. Casual visitors who access only the office or staging areas of the support zone are not subject to these training requirements.

Table 4-1 Training Requirements

Training	Worker[a]	Worker[b]	Field Mgr. & SSHO	Site Visitor*
40 Hour HAZWOPER	N	Y	Y	N
HAZWOPER Annual Refresher (8 hours)	N	Y	Y	N
HAZWOPER Supervisor (8 hours)	N	N	Y	N
Hazard Communication	N	Y	Y	N
Hearing Conservation	N/Y	Y	Y	N
Respiratory Protection	N	Y	Y	N
Pre-entry Briefing	Y	Y	Y	Y
Safety Briefing	Y	Y	Y	N
PPE	N	Y	Y	N
First Aid/CPR	2 workers	2 workers	N	N

[a]Workers performing non-intrusive tasks under conditions that present no possibility of exposure to hazardous waste or chemicals. This includes Surveyors and USACE personnel that enter the site after closure. If workers are exposed to noise levels above 85dBA, they must be enrolled in a HCP.
[b]Workers performing tasks inside the STEP-controlled areas under conditions that pose a potential risk of exposure to hazardous waste or chemicals. This includes all STEP personnel and sub-contractors performing work as part of the project.
*Truck drivers, vendors and similar personnel.

CPR = cardiopulmonary resuscitation
HAZWOPER = hazardous waste operations and emergency response
PPE = personal protective equipment
SSHO = site safety and health officer

The following sections present brief summaries of the training requirements. These summaries include a course description and guidance on who should take each course.

4.1 OFF-SITE TRAINING

The 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course is required for general site workers engaged in HTRW activities that expose or potentially expose them to hazardous substances. Three days of relevant field experience is required in conjunction with this training.

The 24-hour HAZWOPER course is required for on-site workers who are not anticipated to be exposed to hazardous chemicals at or above the permissible exposure limit (PEL). One day of relevant field experience is required in conjunction with this training.

The 8-hour HAZWOPER refresher is required annually to maintain currency in both the above courses.

HAZWOPER Supervisor training is required for personnel who directly supervise hazardous waste site workers. This is an 8-hour course that must be taken once. The 40-hour course is a prerequisite for this training.

Hazard Communication is required for all site workers. This training is designed to inform personnel of the characteristics of chemicals with which they will be working, the hazards presented by those chemicals, and methods of protection from exposure to the chemicals. This generalized training is supplemented by training on site-specific chemicals.

Hearing Conservation is required on an annual basis for all employees enrolled in a hearing conservation program, as mandated by 29 *Code of Federal Regulations* (CFR) 1910.95. This includes all employees exposed to occupational noise in excess of 85 dBA as a time-weighted average.

Respiratory Protection is required for all workers who wear respirators. This training is met by taking the 40-hour HAZWOPER course.

4.2 SITE-SPECIFIC TRAINING

On-site personnel must receive site-specific training. Site workers will receive information on site hazards, hazard controls, and emergency procedures. Visitors will receive information that is relevant to the purpose of their visit. Signatures of those attending and the type of briefing must be entered into the field logbook before site access will be granted. Site-specific training will include the following information, as appropriate:

- names of health and safety personnel;
- contents of the project SSHP;
- hazards and symptoms of chemical exposure;
- physical hazards on the site;
- location and availability of the Hazard Communication Program;
- site and task-specific PPE;
- site-specific respirator training;
- safe work practices;
- safe use of engineering controls and equipment;
- medical surveillance requirements;
- site control measures;
- reporting requirements for spills and emergencies;
- personnel decontamination procedures;
- contingency plans; and
- emergency equipment.

Safety briefings will be held daily before the commencement of work activities and whenever conditions at the site change. These will be conducted by the Field Manager or SSHO and will be required for all site workers. These briefings will address site-specific safety issues and will be used as an opportunity to refresh workers on specific procedures and controls.

4.3 DOCUMENTATION

Documentation of the required training will be maintained in the on-site project files. This documentation will include copies of personnel training certificates or other verifications, copies of the first aid/CPR certificates, and entries in the project logbook showing the topics covered and signatures of those attending on-site training. Copies of required training documentation for those individuals expected to perform fieldwork during this project are presented in Appendix C of this SSHP.

5. PERSONAL PROTECTIVE EQUIPMENT

PPE requirements for this site are based on the site-specific physical and chemical hazards. In cases in which multiple hazards exist, a combination of protective equipment will be selected so that adequate protection is provided for each hazard. For task-specific equipment, see the hazard/risk analysis section of this SSHP. In accordance with government requirements, two sets of PPE will be maintained on-site by STEP for use by government officials during site visits.

5.1 PPE PROGRAM

STEP's PPE Program is detailed in the STEP S&H Manual, Section 4.0 – Specific Safety and Health Programs, "Personal Protective Equipment Program", included in Appendix G, which meets the requirements of 29 CFR 1910, Subpart I, and EM 385-1-1 Section 5. The level and type of PPE selected for particular tasks are based on the following:

- potential for exposure;
- route of exposure;
- measured or anticipated concentration of contaminant;
- toxicity, reactivity, or other measure of adverse effect; and
- physical hazards.

In situations where the type of chemical and/or concentration is not known, the appropriate protection is selected based on the judgment of the STEP Safety and Health Manager until hazards can be evaluated further.

The SSHO may raise or lower the level of PPE worn by workers, depending on the site-specific hazards encountered in the field. Before the level of PPE is lowered, the Field Manager and the Safety and Health Manager will be contacted and consulted. If site conditions indicate that the level of PPE is not sufficient or work must be stopped, the SSHO will take appropriate action immediately and will contact the Site Manager and/or the Safety and Health Manager afterward. Indications for a possible reassessment of PPE selection may include the following:

- commencement of an unplanned phase of work presenting unanticipated hazards;
- working in unplanned temperature extremes;
- evidence of contamination that is unexpected;
- exceeding the action limits of chemical hazards; and
- changing the scope of work so that the degree of contact with contaminants changes.

5.2 TYPES OF EQUIPMENT

This section presents the types of protective clothing and equipment that may be used for this project. Requirements for task-specific protective equipment are presented in the hazards analysis (Table 2-2 of this SSHP). Levels of protection that will be used to protect workers against hazards anticipated at the site are contained in the following list.

Level D (Modified)

- Coveralls/field clothes
- Safety boots
- Safety glasses with side shields
- Hard hat
- Ear plugs
- Nitrile or latex gloves when taking samples or handling contaminated soil
- Leather or similar gloves when handling sharp or abrasive materials

5.3 CLEANING AND STORAGE

If site tasks require the use of chemical protective clothing, re-usable articles will be properly decontaminated prior to re-use. Disposable equipment will be discarded in sealed containers and handled as contaminated waste. Unused chemical protective clothing will be stored in clean staging areas until needed.

6. MEDICAL SURVEILLANCE

All employees performing on-site hazardous waste activities will be enrolled in a medical surveillance program in accordance with 29 CFR 1910.120(f) and 1910.134. The purpose of the medical surveillance program is to monitor and assess the workers' health and fitness. Employees are provided with summaries of the medical examination results following each exam.

The frequency of employee medical exams shall occur as follows:

- prior to assignment,
- annually for every covered employee,
- at termination of employment or reassignment; and
- as soon as possible following notification by the employee that he/she has developed signs or symptoms of exposure to a hazardous substance.

Copies of required medical clearances and current fit tests for those employees expected to perform fieldwork during this project are presented in Appendix C of this SSHP.

7. EXPOSURE MONITORING

Assessment of airborne chemical concentrations will be performed as appropriate to ensure that exposures do not exceed acceptable levels. Action levels with appropriate actions have been established for this type of monitoring. In addition, the SSHO may perform or require additional exposure monitoring as conditions dictate. It is not anticipated that site workers will be exposed to contaminants above established action levels, but direct reading instruments will be utilized for real-time monitoring. The minimum monitoring requirements and action levels are presented in Table 7-1.

Table 7-1 Requirements and Action Limits

Hazard	Area	Frequency	Limit	Action
VOCs	Breathing zone	Upon initial intrusion; at least every 30 minutes afterward	25 ppm 50 ppm	Monitor for benzene; increase monitoring to every 15 min. Evacuate immediate area until levels below 10 ppm
Benzene	Breathing zone	When VOC levels 25 ppm	0.5 ppm	Evacuate immediate area until benzene below 0.5 ppm
Temperature	General work area	Every 2 hours	> 70° F	Implement administrative controls (Section 8.14)

ppm = parts per million
VOC = volatile organic compound

7.1 AIR MONITORING

Periodic air monitoring will be conducted throughout the excavation and well installation phases of this project. The SSHO will utilize a Biosystems Porta FID flame ionization detector. This instrument is capable of detecting most VOCs with an ionization potential of 15.4 eV or less, and therefore should be capable of detecting the contaminants expected on site. The FID will be calibrated daily prior to use and will be zeroed known to be free of organic vapors. (Note: See Table 2-3 for ionization potentials.) Most of the constituents of the fuels anticipated on site have relatively high PELs and relatively low vapor pressures with the exception of benzene; however, benzene is typically a minor constituent (usually less than 1 percent) of the total volatiles in the fuel and historically is detected at much lower concentrations than other constituents such as toluene and ethylbenzene.

Direct readings will be taken in the breathing zone of workers during the initial excavation and well-drilling phases of the project and periodically throughout all intrusive activities. If breathing zone concentrations exceed 25 ppm sustained for 5 minutes, the SSHO shall sample the air for benzene using colormetric detector tubes. If benzene concentrations meet or exceed 1 ppm, the immediate site shall be evacuated until total VOC readings are below 10 ppm. If total VOC readings reach 25 ppm and benzene concentrations are below 0.5 ppm, work shall continue but breathing zone monitoring shall be conducted every 15 minutes until levels are below 10 ppm. If total VOC readings reach a level of 50 ppm, the immediate site shall be evacuated until VOC levels return to below 10 ppm. If VOC and/or benzene levels are persistently above the stated action levels, site work shall be temporarily halted and the SSHO shall contact the STEP Safety and Health Manager for guidance.

7.2 NOISE MONITORING

STEP will conduct periodic noise monitoring during operation of heavy equipment such as drill rigs, backhoes and generators. If noise levels within the established exclusion zone are 85 dBA or greater, hearing protection will be required. Hearing protection with a noise reduction rating (NRR) sufficient to reduce worker exposure below 85 dBA will be utilized. The minimum NRR for hearing protection used on this project will be 32. Hearing protection with an NRR of 32 should be adequate for noise levels up to 110 dBA. If noise levels exceed 110 dBA, double hearing protection will be required.

8. STANDARD OPERATING PROCEDURES

This section contains general safety rules that apply to all operations conducted by STEP and its subcontractors. These requirements apply to all STEP projects in general; therefore, there may be some portions that do not apply to this project specifically. The provisions of this plan are mandatory for all on-site employees and visitors.

8.1 GENERAL SAFETY RULES

- Daily safety meetings/briefings will be conducted by the SSHO or Field Manager and all field workers are required to attend.
- The SSHO, Field Manager, or other STEP management personnel are responsible for suspending or stopping work in the event of:
  - inadequate safety and health precautions on the part of any site personnel or
  - potential significant environmental impact as a result of planned activities.
- Personnel will perform only those tasks that they believe they can do safely.
- Personnel will notify the SSHO of any medical conditions that require special consideration.
- Proper workplace housekeeping will be maintained at all times.
- Contact with potentially contaminated materials will be avoided, unless it is directly related to a planned work task.
- All injuries and/or accidents will be reported to the SSHO or Field Manager immediately.
- All site workers will adhere to a buddy system whenever in the exclusion zone or when otherwise engaged in field activities.
- Horseplay is strictly prohibited on the project site.

8.2 PERMITS

STEP will obtain or coordinate with the USACE project representative to obtain all necessary permits for the safe execution of this project. At a minimum, these will include excavation permits prior to any intrusive activities.

8.3 CONFINED SPACE ENTRY

Any entry into a confined space will be performed in accordance with 29 CFR 1910.146, EM 385-1-1, and STEP S&H Manual, Section 4.0 – Specific Safety and Health Programs, "Confined Space Entry", included in Appendix G.

8.4 HOT WORK AND FIRE PROTECTION

Cutting may be required for removal of the skimmer. All hot work will be conducted in accordance with EM 385-1-1, Sections 9 and 10.

- Hot work (welding and cutting) will be conducted using a welder's helmet or shaded goggles, leather gloves, and a long sleeve shirt.
- A fire extinguisher rated no less than 10-ABC will be readily available in the vicinity of all hot work.

- Sources of ignition will be kept at least 50 feet from flammable storage areas.
- Flammable storage areas will be posted "No Smoking or Open Flames".
- At least one fire extinguisher rated at least 20-B will be kept within 50 feet of all flammable storage areas.
- An approved flammable storage cabinet will be used to store 25 gallons or more of flammable liquids indoors.
- All flammable liquids (other than decontamination solvents) will be kept in safety containers with flame arresters.

8.5 ELECTRICAL SAFETY

All electrical work will be conducted in accordance with 29 CFR 1910, Subpart S and EM 385-1-1, Section 11.

- All portable electrical equipment will be double insulated or grounded and connected through a ground fault circuit interrupter (GFCI).
- Conductive materials will be kept clear of energized power lines.
- Access to areas where high voltage is present will be restricted to authorized personnel.

8.6 EXCAVATION SAFETY

All excavations will be conducted in accordance with 29 CFR 1926, Subpart P, and EM 385-1-1, Section 25.

Prior to opening any excavation, the site will be verified free from underground utilities by contacting the local utility company or appropriate installation personnel. If underground utilities are present, they will be located and protected from damage or movement. Other hazards, such as the potential for UXO, building foundations, or unstable encumbrances, will also be controlled.

Personnel will maintain a distance of at least 3 feet from the edge of trenches deeper than 4 feet. Visual examination of trenches will be done from the ends of the trench rather than the sides. All spoils will be maintained at least 3 feet from the edge excavations.

If personnel must enter excavations greater than 4 feet deep, the requirements of 29 CFR 1926.651 will be applied. This includes the daily inspection of the excavation by a competent person and the use of either shoring or sloping. Shoring will be accomplished by utilizing an appropriate trench shield or box. If sloping is used as a protective measure, the sides of the excavation will be sloped at a 34 degree angle (1.5:1). Entries into excavations greater than 4 feet deep will be treated as a confined space entry and will require testing of the atmosphere for oxygen, flammable gases/vapors, and toxic gases/vapors.

8.7 MACHINE GUARDING

All equipment will be operated with all guards and safety devices provided by the manufacturer in place and in compliance with 29 CFR 1910, Subpart O, and EM 385-1-1, Section 16B. If a guard or device must be removed for servicing or repair, the equipment will be disabled to prevent movement or unexpected energization.

8.8 LOCKOUT/TAGOUT

All non-routine service and maintenance of equipment will be conducted in accordance with 29 CFR 1910.147 and STEP S&H Manual, Section 4.0 – Specific Safety and Health Programs, "Electrical Safety", included in Appendix G.

8.9 FALL PROTECTION

Workers conducting activities subject to a fall of greater than 4 feet shall be protected by a standard rail or the use of a fall protection device. A standard rail consists of a top rail (42 inches nominal from the working surface), a mid-rail, and supporting posts a minimum of 8 feet apart. The rail shall be capable of safety supporting a force of 200 pounds in any direction. Fall protection devices shall consist of a full-body harness and a lanyard attached to an anchorage point capable of withstanding a shock force of 5400 pounds.

8.10 HAZARD COMMUNICATION

Hazard communication will be governed by 29 CFR 1910.1200, EM 385-1-1, Section 8, and STEP S&H Manual, Section 4.0 – Specific Safety and Health Programs, "Hazard Communication", included in Appendix G. As a minimum, the following actions will be taken:

- All hazardous material containers will be labeled. Labels will include:
  - Contents of the container
  - Designation of health, flammability, and reactivity hazards
  - Name and address of the manufacturer
- MSDSs for all hazardous materials that are present will be maintained on site.
- Site-specific training will include hazards posed by the materials, protective measures, and emergency procedures.

8.11 ILLUMINATION

Most site field work will be conducted during daylight hours. Field work conducted during non-daylight hours will be identified in the hazard assessment table. Artificial illumination will be utilized to ensure general work areas are illuminated to a level of at least 10 foot candles.

8.12 SANITATION

- Means for washing hands and faces will be provided at the work site.
- Potable drinking water will be provided in labeled, sanitary dispensers.
- An adequate number of toilet facilities will be provided based on the number of workers.

8.13 DRILL RIG OPERATIONS

8.13.1 General Drilling Practices

- Operating manuals will be present on site for each type of drill rig in use.
- Drill rigs will have at least two functional kill switches. These switches will be inspected on a daily basis to ensure proper operation.
- Drill rigs will be equipped with a functional back-up alarm.
- Drill rigs will be inspected weekly by the driller and the inspection will be confirmed by the SSHO.
- Only the driller, the driller's helper and critical personnel will be allowed near the moving parts of the drill rig.
- Drill sites will be verified free of underground utilities.
- Drilling crews and personnel who work near the drilling rig will be trained in the location and use of kill switches.
- Work areas and walkways will be maintained free from obstructions.

8.13.2 Hoisting Operations

- The mast will not be raised unless the area is free of overhead obstructions and the proper distance from power lines.
- The mast will not be raised until the rig has been blocked, leveled, and chocked.
- Rigging equipment for material handling will be checked prior to use on each shift and as often as necessary. Defective rigging equipment will be removed from the site.
- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for that use.
- Workers will stand clear of the well bore when any wire line device is being used.
- Loads will not be lifted over workers.

8.13.3 Cat Line Operators

- The cat head area will be kept free of obstructions and entanglements.
- The operator will not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.
- Personnel will not stand near, step over, or go under a cable or cat line that is under tension.

8.14 TEMPERATURE EXTREMES

Hazards associated with temperature extremes will be controlled as required by EM 385-1-1 Section 6 and in accordance with Guidance from the American Council of Government Industrial Hygienists (ACGIH) temperature stress guidelines as detailed in "Threshold Limit Values and Biological Exposure Indices" (2003). It is the responsibility of the SSHO and crew members to ensure that temperature stress controls are adequate for the conditions and tasks.

8.14.1 Heat Stress

General controls for the prevention of heat stress include making fluids readily available, taking breaks in cool or shaded areas, scheduling work for cooler portions of the day, and providing forced ventilation. Specific requirements include those listed in Table 8-1.

- When ambient temperatures reach 70° F, workers will be encouraged to take unscheduled breaks as needed, in a cooler area.
- If ambient temperatures are expected to exceed 70° F, site-specific training will include heat stress recognition and control and first aid measures for heat-related illnesses.
- If ambient temperatures exceed 70° F, cool water and electrolyte-replenishing fluids (such as Gatorade) will be readily accessible, and workers will be encouraged to drink frequently.
- When ambient temperatures exceed 70° F, physiological monitoring (body temperature, pulse rate) will be conducted as determined by the SSHO. Physiological monitoring will be performed within 1 minute of stopping work. The action levels and appropriate actions are detailed in Table 8-1.

Table 8-1 Action Levels for Heat Stress Monitoring

Action Levels	Actions
Monitoring results below action level: - pulse rate ≤110 beats per minute - temperature ≤99.6°	Return to work and continue observation.
Monitoring results exceeding action level: - pulse rate ≥110 beats per minute - body temperature ≥99.6°F	Rest in cooler area until monitoring results fall below action levels. Remeasure pulse and temperature after 5 minutes.
Monitoring results exceed action levels after 5 minutes of rest: - pulse rate ≥110 beats per minute - body temperature ≥99.6°F	Implement additional heat stress control measures such as shading the work area, adjusting the work hours, providing personnel cooling devices, or modifying PPE.

PPE = personal protective equipment

8.14.2 Cold Stress

Critical measures in preventing cold stress are wearing adequate clothing and staying dry. The SSHO and Field Manager will ensure the capability exists to move workers who become wet to a sheltered and warm area. The following steps, which have been adapted from the ACGIH guidelines, will be implemented when working in cold environments.

- If the ambient temperature falls below 40°F, site training will include prevention of cold temperature injuries, cold injury symptoms, and cold injury first aid.
- A heated break area will be provided if ambient temperatures fall below 32°F.
- Breaks will be taken in warm areas at a minimum of every 2 hours when ambient temperatures are below 32°F.
- Workers will be allowed to take unscheduled breaks in warm areas, if needed.

- If the equivalent chill temperature (ambient temperature plus wind factor) is less than -29°F, outdoor work will be discontinued.

9. SITE CONTROL

The SSHO will be responsible for establishing the site control zones, as necessary, around STEP controlled areas that present physical or chemical hazards. Implementation of control zones will minimize the number of workers potentially exposed to hazards and will minimize the spread of possible contamination from the site. The SSHO will monitor the implementation of the site control work rules and will report any deviations from prescribed practice to the Field Manager or stop work as appropriate.

The exact location of control zones will vary depending on site conditions and work tasks; therefore, it is not possible predetermine the exact size and location of control zones. STEP will attempt to exclude all non-authorized personnel from exclusion and contamination reduction zones. If unauthorized personnel enter and refuse to leave the STEP controlled control zones, work will be stopped and the USACE Technical Manager will be notified.

9.1 EXCLUSION ZONE

The exclusion zone (EZ) is that area where the greatest potential for exposure to contamination exists. Access to the EZ will be restricted to authorized STEP and subcontractor personnel. The perimeter of the EZ will be demarked by barricade tape, rope, or similar marking. The entry and exit locations for the EZ will be appropriately identified.

The standard rules below will apply to all entry into the EZ:

- The SSHO or Field Manager will approve and log entry into the EZ.
- All personnel entering the EZ will wear the prescribed level of protective clothing.
- All hand-to-mouth contact (food, drink, tobacco, etc.) is prohibited in the EZ.
- All personnel in the EZ will follow the buddy system.

EZs will be established around all drill rigs, areas of heavy equipment use, and all activities where chemical contamination is a potential hazard. At a minimum, the size of the EZ around a drill rig will be at least the height of the mast. The EZ for all other operations will be at least 10 feet in diameter.

9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be established, as necessary, between the exclusion zone and the support zone. The entry and exit points will be visually defined at the perimeter of the zone. Activities that may occur in the CRZ include decontamination of personnel and equipment, replenishment of supplies, or staging of samples or materials.

All personnel entering the CRZ will wear the prescribed level of protection and hand-to-mouth activities will be prohibited.

9.3 SUPPORT ZONE

The support zone is the clean and relatively safe area surrounding the exclusion zone and contamination reduction zone. The support zone is limited to the areas of the site associated with the project and generally does not include such areas as office trailers, roads, and buildings accessible to the public. The primary functions of the support zone are:

- staging areas for clean equipment and supplies and
- location for support services.

9.4 SITE COMMUNICATIONS

Field personnel will be capable of contacting other field personnel and outside agencies. Communication on site may be accomplished verbally, using hand signals, or by handheld radios. If the size of the site dictates, portable air horns may be used to signal other site personnel. If telephone service is not readily available, project personnel may be equipped with cellular phones.

10. HYGIENE AND DECONTAMINATION

Specific procedures will be used to control the spread of contamination from the exclusion zone and ensure that workers are sufficiently free of contamination to preclude adverse health effects. These procedures will include the doffing of PPE and personnel decontamination. The SSHO will ensure the construction of decontamination stations, as necessary, and ensure that site personnel follow acceptable decontamination processes. The following sections present the basic requirements for personnel. The SSHO may modify these procedures if improvements are needed.

10.1 LEVEL D MODIFIED DECONTAMINATION

Step 1: Remove disposable gloves and boot covers (if needed)

Gloves and boot covers will be turned inside out and deposited in a designated container.

Step 2: Field Wash

Wash face and hands. This may be accomplished with soap and water or the use of disinfectant towels.

10.2 LEVEL C DECONTAMINATION

Step 1: Segregated Equipment Drop

Deposit equipment used in the exclusion zone on plastic sheets or in containers with plastic liners.

Step 2: Primary Wash

Wash/rinse gross contaminants from outer boots (or boot covers) and outer gloves. Contain decontamination fluids in a receptacle that can be sealed, or transfer fluids into a sealable container.

Step 3: Remove Outer Boots and Outer Gloves

Remove tape from boot (covers) and gloves then remove outer boots and gloves by turning them inside out and placing them in a designated container.

Step 4: Remove Outer Garment

Remove disposable outer garment and place in a designated container. Garment should be turned inside out during removal.

Step 5: Remove Respiratory Protection and Inner Gloves

Remove the respirator. Remove the cartridges and place them in a designated container and dispose appropriately. Place the respirator in a plastic bag or container for further decontamination. Remove the disposable inner gloves and place them in the designated container.

Step 6: Field Wash

Wash face and hands. This may be accomplished with soap and water or the use of disinfectant towels.

11. EMERGENCY PROCEDURES AND EQUIPMENT

The Field Manager will be in charge of all STEP personnel and subcontractors during emergency situations. The Field Manager will be responsible for notifying all emergency contacts, including emergency medical services, fire services, the STEP Project Manager, and the STEP Safety and Health Manager. In the event of an emergency situation, all STEP and subcontractor personnel will participate in a briefing to discuss the event, identify the causes, determine appropriate corrective actions, and evaluate the response.

In the event of an accident or incident, the Field Manager or Project Manager will notify the USACE, Savannah District, Project Manager immediately in accordance with EM 385-1-1.

All accidents will be investigated and reported within 24 hours as specified in EM 385-1-1. The accident report will be completed and submitted to the USACE Occupational Safety and Health Officer at the following address:

U.S. Army Corps of Engineers
Savannah District
CESAS-PM-H (Ana Vergara)
100 West Oglethorpe Ave.
Savannah, Georgia 31401-3604

All on-site personnel will be trained in the requirements of this section. The training will include recognition of emergencies, reporting emergencies, and responding to emergencies.

11.1 POTENTIAL EMERGENCIES

11.1.1 Fires

Small quantities of flammable solvents, gasoline, or diesel fuel may be on site. In the event of a fire, the local fire department will be notified immediately. If it is safe to do so, on-site personnel may attempt to extinguish the fire with available fire extinguishers and isolate any adjacent flammable materials. If there is any doubt of the ability of on-site personnel to safely extinguish the fire, all site personnel will evacuate the area. The supervisor or SSHO will provide the fire department with the relevant information when they arrive on-site.

11.1.2 Chemical Spills

Potential spills include the release of fuels, solvents, lubricants or hydraulic fluids. In the event of a spill or leak, the person making the discovery will immediately notify the SSHO or Field Manager. The Field Manager will determine if the release poses an environmental or safety risk or if it will exceed the capacity of on-site personnel to control and/or clean up. STEP on-site personnel are capable of controlling up to 100 gallons of spilled material. The following STEP personnel are trained and certified to wear respirators and perform emergency shutdown should a chemical release so dictate.

- Burke Arthur
- Jim Madaj

If the release exceeds the ability of on-site personnel to adequately respond, the Field Manager will notify the local fire department or hazardous material response team.

11.1.3 Medical Emergency

In the event of a medical emergency, the Field Manager will immediately notify local emergency medical services. At least two first aid/CPR trained personnel will be on site at all times, and these personnel will perform first aid pending release of the injured person to medical personnel. An injured person, who may be contaminated, will be decontaminated to the extent feasible. Decontamination may be by-passed in the event of life-threatening injuries or illnesses.

11.2 EMERGENCY TELEPHONE NUMBERS

Table 11-1 Emergency Contacts

Contact	Telephone Number
HAAF Military Police	912-352-6133
Fire Department	911
Police	911
Emergency Medical Services	911
Hospital – Memorial Medical Center	912-356-8000
USACE – Savannah District	912-652-6060
STEP – Jim Madaj	865-481-7837
PSC – Mike Palmer	865-777-1401

These telephone numbers will be posted on-site. Prior to initiating on-site work, the SSHO will post a map showing the location of the hospital and directions to the hospital.

11.3 EMERGENCY ALERTING

Each work group will have a device capable of generating an audible alarm. These devices will be used to signal project personnel in the event of an emergency.

11.4 EVACUATION

The SSHO or Field Manager will designate the evacuation routes and assembly areas. All employees will be familiar with these routes and assembly areas.

11.5 EMERGENCY EQUIPMENT

If the SSHO does not feel that on-site personnel can safely handle an emergency situation with the available equipment, the crew will use alternative methods such as allowing a small fire to burn out or evacuating the site. The following emergency equipment will be maintained on-site at all times.

- a first aid kit in an all-weather container; inspected weekly;
- a compressed air horn or vehicle horn;
- an emergency eyewash bottle;
- fire extinguishers;
- a basic spill kit capable of handling or containing a small spill; and
- telephone and/or portable radios.

11.6 LIGHTNING

Under weather conditions conducive for electrical storms in the area, a weather band radio will be monitored continually. If storms are reported within five miles of the project site, all work will be suspended and all site workers will exit the site and seek shelter in the company trucks until the threat of lightning has passed.

12. LOGS, REPORTS, AND RECORDKEEPING

A system of logs and reports will be used to document activities related to site safety and health. The SSHO will generate a brief weekly summary of safety and health issues and resolutions. The report will include all injuries, accidents, near-misses, and interpretations of the SSHP.

In addition to the weekly reports, the following documents will be generated and submitted to the USACE, Savannah District Project Manager.

- Certification records including copies of the safety and health training, medical clearances, and respirator fit test records for on-site personnel. These records are included in Appendix C of the SSHP and will be kept on-site.
- On-site training logs that will include the signatures of the trainer and all attendees. They will also include documentation of pre-entry briefings, safety meetings, and visitor training.
- Safety inspection logs that will include the dates of the inspection, the identity of the person conducting the inspection, the areas inspected, findings, and corrective actions.
- Sign-in log for all employees and visitors. It will contain the names of persons who perform on-site work or visit the site.
- Environmental and personal exposure monitoring/sampling results will be maintained in a log that will contain the monitoring data, location and time, types of work being done, calibration records, and identity of person conducting the monitoring.

13. REFERENCES

ACGIH (American Council of Government Industrial Hygienists), 2003. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

NIOSH (National Institute of Occupational Safety and Health), June 1997. *NIOSH Pocket Guide to Chemical Hazards.*

STEP (Solutions To Environmental Problems, Inc.), August 2001. *Solutions To Environmental Problems (STEP), Safety and Health Manual.*

USACE (U.S. Army Corps of Engineers), September 1999. *Safety and Health Requirements Manual* (EM-385-1-1).

USACE, September 2000. *Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities* (ER 385-1-92).

APPENDIX A

REPORTING FORMS

STEP, Inc.
Tool Box Safety Meetings
Documentation Form

Date: _____ Supervisor/Crew Leader: _____

Topic: _____ Job Location: _____

Accident Investigation Review: _____

_____

Job Hazards Review: _____

_____

Old Business: _____

_____

New Business: _____

_____

Print Employee Name	Employee Company

WEEKLY JOB SITE CHECKLIST

PROJECT NAME: JOB/TASK #:

PROJECT SUPERINTENDENT:

DESCRIPTION	YES	N/A	NO	IF NO, WHY
1.0 Project Administration: 1926, Subpart C				
1.1 OSHA and other required posters/signs posted?				
1.2 Do all employees meet the required training level?				
2.0 Housekeeping: 1926, Subpart C				
2.1 General orderliness of the site acceptable?				
2.2 Passageways and walkways clear?				
2.3 Containers with lids provided for trash?				
3.0 Medical Services and First Aid: 1926, Subpart D				
3.1 One employee on-site with current CPR/First Aid?				
3.2 First Aid kit provided and properly maintained?				
3.3 Emergency communication and numbers available?				
4.0 Sanitation: 1926, Subpart D				
4.1 Are the toilet facilities adequate and clean?				
4.2 Adequate supply of drinking water provided?				
5.0 Hazard Communication Program: 1926, Subpart D				
5.1 Is a hazardous material inventory available?				
5.2 Are MSDSs available for all hazardous materials on site?				
5.3 Are all chemical containers properly labeled?				
5.4 Have all employees been trained?				
6.0 Personal Protective Equipment, 1926, Subpart E				
6.1 Are approved hard hats worn by all personnel?				
6.2 Are eye and face protection provided and use enforced?				
6.3 Is hearing protection provided and use enforced?				
6.4 Are full body harnesses and shock absorbing lanyards provided when required?				
6.5 Is all equipment inspected regularly and maintained in a safe and sanitary condition?				

DESCRIPTION	YES	N/A	NO	IF NO, WHY
7.0 Fire Protection and Prevention: 1926, Subpart F				
7.1 Is the necessary fire fighting equipment provided?				
7.2 Access to hydrants and extinguishers kept open?				
7.3 "No smoking" areas posted and enforced?				
7.4 Are all combustible or flammable materials stored, dispensed, and used properly?				
8.0 Signs and Signals: 1926, Subpart G				
8.1 Are warning signs properly posted and visible?				
8.2 Is the construction area properly posted?				
9.0 Handling and Storage of Materials, Subpart H				
9.1 Is all material stacked, racked, blocked, or otherwise secured to prevent falling or collapse?				
9.2 Are correct lifting methods used?				
9.3 Is all rigging equipment properly used and inspected?				
10.0 Flammable gasses and liquids: 1926, Subpart H				
10.1 All containers and storage areas properly posted?				
10.2 Proper storage practices in place?				
10.3 Proper protection from fire hazards?				
11.0 Tools - Hand and Power: 1926, Subpart I				
11.1 Proper tools being used for the job?				
11.2 Proper inspection and maintenance of tools?				
11.3 Tools and cords in good condition? Free of defects?				
11.4 All mechanical safeguards in place?				
11.5 Ground Fault Circuit Interrupters being utilized?				
12.0 Welding and Cutting: 1926, Subpart J				
12.1 Power cables and hoses protected and in good repair?				
12.2 Welding screens or shields being utilized?				
12.3 Gas cylinders properly stored and used?				
13.0 Electrical, 1926, Subpart K				
13.1 Adequate wiring, well insulated, no frayed cords?				
13.2 Are extension cords (three wire type) designed for hard or extra hard usage?				

DESCRIPTION	YES	N/A	NO	IF NO, WHY
14.0 Scaffolding: 1926, Subpart L				
14.1 Erection by competent person?				
14.2 Are footings on a substantial base?				
14.3 Is scaffold tied to a structure or outriggers in place as required?				
14.4 Are guardrails, midrails, or toeboards provided?				
15.0 Floor and Wall Openings: 1926, Subpart M				
15.1 Are all wall openings guarded?				
15.2 Are open sided platforms 4ft. above the floor guarded?				
16.0 Cranes and Derricks: 1926, Subpart N				
16.1 Are rated load capacities, operating speeds, special instructions and hand signals posted on equipment?				
16.2 Are inspection and maintenance logs kept?				
17.0 Motor Vehicles and Heavy Equipment: 1926, Subpart O				
17.1 Lights, brakes, warning devices operative?				
17.2 Rollover Protection (ROPs) provided as required?				
17.3 Is all glass in good condition, back up signals operative, seat belts and fire extinguishers provided?				
18.0 Excavations - Shoring and Trenching: 1926, Subpart P				
18.1 Adequate access/egress provided every 25 feet?				
18.2 Is the excavation barricaded 6 feet from the edge?				
18.3 Are adequate control measures in place (i.e. shoring, sloping)?				
19.0 Ladders: 1926, Subpart X				
19.1 Are ladders regularly inspected?				
19.2 Are ladders properly secured to prevent falling?				
19.3 Do the side rails extend 36 in. above top of landing?				
Environmental Protection				
20.1 Sediment controls in place (silt fence, haybales)?				
20.2 Equipment and vehicles free from fluid leaks?				
20.3 Spill kit on-site available for use?				

ADDITIONAL COMMENTS

SOLUTIONS TO ENVIRONMENTAL PROBLEMS, INC.
DRILL RIG CHECKLIST

Site Name: _____

Equipment Type (Model and Manufacturer): _____

Serial Number: _____ Owner of Rig: _____

Inspection Performed by: _____
(Driller's Signature) (Date)

Checklist Reviewed and Emergency
Shutdown Observed by: _____
(Signature) (Date)

1.0 GENERAL

1.1 Check all safety devices that are part of drill rig and can be verified (* see note). Are all devices intact and operating as designed? Yes ☐ No ☐

Emergency Interrupt System

A.	Kill Switch 1	Yes ☐	No ☐	N/A ☐
B.	Kill Switch 2	Yes ☐	No ☐	N/A ☐
C.	Kill Switch 3	Yes ☐	No ☐	N/A ☐
D.	Kill Switch 4	Yes ☐	No ☐	N/A ☐
E.	Kill Switch 5	Yes ☐	No ☐	N/A ☐
F.	Other _____	Yes ☐	No ☐	N/A ☐
G.	Other _____	Yes ☐	No ☐	N/A ☐
H.	Other _____	Yes ☐	No ☐	N/A ☐

* Note: All safety devices not otherwise listed in this checklist should be identified for each drill rig at the beginning of each project and subsequently checked at each inspection. Testing of all safety devices must be observed by health and safety personnel. List only safety devices that can be checked without disassembly or without rendering the device ineffective. This checklist does not cover United States Department of Transportation requirements.

1.2 Is the proper type and capacity of fire extinguisher(s) present properly charged, and inspected? Yes ☐ No ☐ N/A ☐

1.3	Is rig properly grounded?	Yes ☐	No ☐	N/A☐
1.4	Are rig and mast a safe distance from electrical lines?	Yes ☐	No ☐	N/A☐
1.5	Can mast be raised without encountering overhead obstruction?	Yes ☐	No ☐	N/A☐
1.6	Have spill prevention materials been placed under rig (i.e. plastic sheeting)?	Yes ☐	No ☐	N/A☐
1.7	Is a spill kit present?	Yes ☐	No ☐	N/A☐
1.8	Is the safe operating zone/exclusion zone posted (minimum radius at least equal to height of raised drill mast)?	Yes ☐	No ☐	N/A☐
1.9	Do all modifications made to the drill rig permit it to operate in a safe manner and allow the drill to operate within the manufacturer's specifications?	Yes ☐	No ☐	N/A☐
1.10	Are moving parts (excluding cathead) properly guarded?	Yes ☐	No ☐	N/A☐
1.11	Are all exhaust pipes, which could come into contact with personnel during normal operations properly guarded?	Yes ☐	No ☐	N/A☐
1.12	Are tank(s) and lines free of leakage?	Yes ☐	No ☐	N/A☐
1.13	Have all normal or manufacturer-recommended maintenance activities been performed at the appropriate frequency?	Yes ☐	No ☐	N/A☐
1.14	Are walking and standing surfaces, steps, rungs, etc. free of substances (excess grease, oil, or mud) that could create a hazard?	Yes ☐	No ☐	N/A☐

2.0 CONTROL MECHANISMS

	Are all control mechanisms and gauges on the drill rig functional and free of grease, oil and ice (checked while running)?	Yes ☐	No ☐	N/A☐

3.0 HYDRAULICS AND PNEUMATICS

Note: The mast should be lowered during the completion of this section to allow inspection of portions of the lifting mechanisms normally out of reach during operation.

3.1	Do all hydraulic reservoirs have proper fluid levels?	Yes ☐	No ☐	N/A☐
3.2	Are hydraulic and/or pneumatic systems in good condition and functioning correctly (checked while running)?	Yes ☐	No ☐	N/A☐

4.0 LIFTING MECHANISMS

Note: The mast should be lowered during the completion of this section to allow inspection of portions of the lifting mechanisms normally out of reach during operation.

4.1	Have all wires, ropes, cables, and lines that are kinked, worn, corroded, cracked, bent, crushed, frayed, stretched, birdcaged, or otherwise damaged been replaced and the defective equipment removed from the site?	Yes ☐	No ☐	N/A☐
4.2	Have all wires, ropes, cables, and lines been wrapped around winch drums without excessive pinching or binding?	Yes ☐	No ☐	N/A☐
4.3	Are all pulleys undamaged & functional?	Yes ☐	No ☐	N/A☐
4.4	Are all clips, clamps, clevises, hooks or other hardware used to rig wires, ropes, cables, or lines undamaged and attached properly?	Yes ☐	No ☐	N/A☐
4.5	Do all eyes formed in wires, ropes, cables, or lines attached to the rig use a thimble to retail the shape of the eye?	Yes ☐	No ☐	N/A☐
4.6	Do all hooks have functioning safety gates/latches?	Yes ☐	No ☐	N/A☐

5.0 NONCONFORMING ITEMS

5.1 When did the last operation checklist inspection take place for this drill rig at this site?
Date: _____

5.2 Have any nonconforming items been carried over from the last inspection? List any items and dates of original nonconformance.

A. _____

Date: _____

B. _____

Date: _____

C. _____

Date: _____

D. _____

Date: _____

Any nonconforming items must be documented in the following remarks section and reported to the field operations manager for the project prior to operating the drill rig. Reference all remarks to the item numbers noted above.

Remarks:

_____

_____

_____

_____

SOLUTIONS TO ENVIRONMENTAL PROBLEMS, INC.
DAILY EQUIPMENT CHECKLIST

Operator: _____
Equipment Type: _____

	Operational Yes	No
1) Tires	☐	☐
2) Oil	☐	☐
3) Fuel System	☐	☐
4) Hydraulic Fluid	☐	☐
5) Hydraulic System (Pump, Hoses, Fittings)	☐	☐
6) Brakes – Including Parking Brake	☐	☐
7) Windshield:		
a) No Cracks	☐	☐
b) Clean (Clear Visibility)	☐	☐
c) Wipers Operational	☐	☐
8) Steering System	☐	☐
9) Seat Belts	☐	☐
10) Controls	☐	☐
11) Fire Extinguisher (Current Inspection – Monthly)	☐	☐
12) Horn	☐	☐
13) Back-up Alarm Functioning	☐	☐
14) Lights		
a) Head Lights	☐	☐
b) Tail Lights	☐	☐
c) Brake Signal	☐	☐
d) Turn Signals	☐	☐
15) Forks	☐	☐
16) Mast Components	☐	☐
17) Rated Load Capacity Posted	☐	☐

Comments

_____

_____

Inspected By (Signature): _____ Date: _____

(For Safety Staff only)	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC ☐ FATAL ☐ OTHER			☐	

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	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ 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)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

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

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

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 help menu)*

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	(CODE) #
PRIMARY		TYPE	
SECONDARY		SOURCE	
f. NATURE OF ILLNESS / INJURY			

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

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

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(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 correspondence code number in box from list - see help menu)*

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

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

See attached page.

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
SIGN: Was design of facility, workplace or equipment a factor?	☐	☐
SPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
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?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

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

See attached page.

b. INDIRECT CAUSE(S)

See attached page.

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

DESCRIBE FULLY:

See attached page.

DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

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

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

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

ENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10. ACCIDENT DESCRIPTION *(Continuation)*

11a. DIRECT CAUSE *(Continuation)*

13b. INDIRECT CAUSES *(Continuation)*

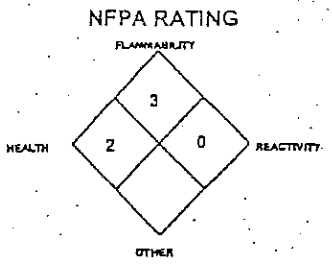
14. ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

APPENDIX B

MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards



PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: BENZENE - C_6H_6
Document Number: 1062

PRODUCT USE: For general analytical/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME: AIRGAS INC.
ADDRESS: 259 Radnor-Chester Road
Suite 100
Radnor, PA 19087-5240

BUSINESS PHONE: 1-610-687-5253
EMERGENCY PHONE: CHEMTREC: 1-800-424-9300
International: 202-483-7616

DATE OF PREPARATION: May 14, 1997
SECOND REVISION: January 16, 1998

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
BENZENE	71-43-2	99.9%	0.5, A1 (Confirmed Human Carcinogen)	2.5, A1 (Confirmed Human Carcinogen)	1	5	500	NIOSH REL: 0.1 ppm TWA; 1 ppm STEL OSHA: 1 ppm TWA; 5 ppm STEL OSHA Action Level: 0.5 ppm EPA-A; IARC-1; MAK-A1; NIOSH-X; NTP-1; OSHA-X;

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Benzene is a colorless, flammable, toxic liquid with a characteristic aromatic odor. Benzene is a confirmed human carcinogen and a possible human mutagen. Inhalation of vapors of Benzene can cause serious, permanent damage to the blood system. Skin and eye contact can be irritating. This liquid is very flammable; vapors are heavier than air and may travel long distances to source of ignition and flashback. If involved in a fire Benzene will decompose to produce toxic gases (e.g., carbon monoxide, carbon dioxide, irritating aldehydes and ketones). Persons responding to fires or emergencies involving Benzene must have adequate fire protection and wear personal protective equipment to protect against the significant health hazards posed by Benzene.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: Benzene is a serious poison by all routes of exposure. The symptoms of each route of exposure are described below.

INHALATION: The immediate symptoms of inhalation of vapors of Benzene are due to the initial excitation, followed by depression of the central nervous system. Central nervous system symptoms include drowsiness, headache, nausea, incoordination and unconsciousness, that can lead to death in severe cases. Other symptoms of acute overexposure to vapors of Benzene can include transient euphoria, ataxia (incoordination of voluntary muscular movements), vertigo, tinnitus, substernal pain, cough, hoarseness and general irritation of the nose, throat and respiratory tract, confusion, stupefaction and coma. In cases of severe overexposure (as may occur in a confined space, or other poorly ventilated areas, or if large volumes are used or released), tremors, convulsions and death, due to respiratory paralysis or circulatory collapse can occur within minutes to several hours following exposure. Reversible liver and kidney effects have been reported after exposure to Benzene. The effects associated with various levels of Benzene vapors are as follows:

CONCENTRATION	SYMPTOM OF EXPOSURE
Brief (10 minute) up to 25 ppm:	No symptoms.
50-150 ppm:	Exhilaration, headache, tiredness, nose and throat irritation.
20,000 (for 5-10 min):	Collapse and death

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	2
FLAMMABILITY	3
REACTIVITY	0
PROTECTIVE EQUIPMENT	X

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

One of the most significant health effects associated with Benzene is the potential for blood system disorders which develop after long-term exposures to relatively low vapor concentrations. There are reports that exposure to low levels (10 ppm) over an extended time period (24 weeks) of Benzene vapors can damage the bone marrow and blood systems. This damage can result in the development of serious health disorders (including anemia and leukemia). Adverse effects on the immune system have also been reported. Refer to "Other Health Effects" in this section for further information.

CONTACT WITH SKIN or EYES: Contact with the skin can cause irritation and redness. Repeated or prolonged contact can also cause dermatitis, resulting in dry, itchy, cracked skin as Benzene is a defatting agent, removing oils from the skin. Contact with the vapors of Benzene and the eyes will be irritating. Direct contact of the liquid with the eyes can cause irritation, pain; prolonged contact may result in tissue damage.

SKIN ABSORPTION: Benzene poisoning through skin contact has been reported, although skin absorption is not considered as significant a route of exposure as via inhalation or ingestion. Symptoms of absorption may be similar to those described in "Ingestion".

INGESTION: Ingestion of Benzene will cause a burning sensation in the mouth and stomach, nausea, vomiting, excess salivation and vomiting of blood. Benzene is readily absorbed into the body following ingestion exposures, producing symptoms of central nervous system depression and other symptoms similar to those described in "Inhalation". If ingested, Benzene presents a potential aspiration hazard. Aspiration of even small amounts of Benzene into the lungs can result in immediate pulmonary edema (a potentially fatal accumulation of fluid in the lungs), chemical pneumonitis and hemorrhage of pulmonary tissue.

INJECTION: Injection is not anticipated to be a significant route of overexposure for Benzene. If Benzene is "injected" (as may occur through punctures by contaminated, sharp objects), symptoms described in "Inhalation" can occur.

OTHER HEALTH EFFECTS: The chief target organ affected by serious Benzene exposure is the blood and bone marrow system. Chronic Benzene exposure eventually leads to pancytopenia (abnormal decrease of all three formed elements of the blood; hemoglobin, disease-fighting leukocytes and blood-clotting thrombocytes), followed by thrombocytopenia (problems with the blood-clotting properties of the blood) and anemia. These syndromes can lead to sudden, overwhelming infections. After exposure to Benzene, bleeding from the nose, gums, or mucous membranes and development of small bruises can occur. Benzene is a confirmed human carcinogen and can produce forms of leukemia. Direct contact with the liquid with mucous membranes will result in the development of hemorrhagic lesions.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Overexposure to may cause the health effects described on the following page.

ACUTE: Acute inhalation overexposure to Benzene will initially act as a narcotic, possibly leading to coma in extreme cases. Following exposure to high concentrations, victims may be unconscious, and if exposure continues, death can follow from respiratory failure and circulatory collapse. Contact with the skin can cause irritation and dermatitis. Contact with the eyes is irritating, causing burning and watering of the eyes. Ingestion of Benzene will cause gastric distress, hemorrhage and possible severe depression of the central nervous system. Aspiration of Benzene into the lungs, following ingestion, can result in severe damage to the lungs; death may result.

CHRONIC: Chronic exposure to Benzene causes serious damage to the health by all routes of exposure. Chronic oral and inhalation exposure causes severe effects on the blood system, including damage to the bone marrow, leading to a decrease in production or changes to the cells of hemoglobin, hematocrit, red and white blood cells. Effects can occur with an exposure level as low as 10 ppm for 24 weeks. Benzene also causes harmful changes to the immune system, decreasing the production of mature B- and T- white blood cells. Benzene is a confirmed human carcinogen, which can produce Hodgkin's Disease, leukemia and lymphomas by inhalation. Human mutation data are reported for Benzene. See Section 11 (Toxicological Information) for further information. Symptoms of chronic exposure by most routes can be delayed for months to years after exposure has ceased.

TARGET ORGANS: Respiratory system, central nervous system, blood and immune systems, bone marrow, heart, liver, kidneys, skin, eyes, and reproductive system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO BENZENE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. If necessary, a Self-Contained Breathing Apparatus should be worn.

INHALATION: If vapors, mists, or sprays of Benzene are inhaled, remove victim to fresh air. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Remove or cover gross contamination to avoid exposure to rescuers.

SKIN EXPOSURE: If Benzene contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention if any adverse reaction occurs.

EYE EXPOSURE: If Benzene or its vapors enter the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INGESTION: If Benzene is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Physicians should refer to "Recommendations to Physicians" in Section 11 (Toxicological Information). Take copy of label and MSDS to health professional with victim.

5. FIRE-FIGHTING MEASURES

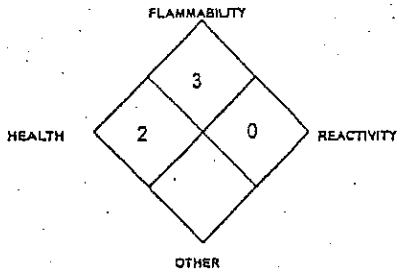
FLASH POINT, (Closed Cup): -11°C (12°F)

AUTOIGNITION TEMPERATURE: 498°C (928°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 1.3%
Upper (UEL): 7.1%

NFPA RATING



See Section 16 for Definition of Ratings

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES (for cooling only)
Foam: YES
Halon: YES
Carbon Dioxide: YES
Dry Chemical: YES
Other: Any "B" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Benzene is a Class IB flammable liquid and presents a serious fire hazard to firefighters. Due to the low flash point, vapors can form explosive mixtures with air, at room temperature. When involved in a fire, this material may decompose and produce toxic gases (e.g., carbon monoxide, carbon dioxide, irritating aldehydes and ketones). The vapors of Benzene are heavier than air and may spread long distances; distant ignition and flash-back are possible. Benzene can float on water; therefore, water contaminated with Benzene can spread the flammable liquid and can spread fire. Containers of Benzene, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Benzene can accumulate static charge by flow or agitation; vapors can be ignited by static discharge.

SPECIAL FIRE-FIGHTING PROCEDURES: In the event of fire, cool containers of Benzene with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Water may not be effective in actually extinguishing a fire involving Benzene, due to its low flash point. Stop the leak or discharge, if possible. For small releases, if it is not possible to stop the leak, and it does not endanger personnel, let the fire burn itself out. Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment, including chemical resistant clothing. Large fires should be fought from a distance with an unmanned hose holder or monitor nozzles. If Benzene is involved in a fire, fire runoff water should be contained to prevent possible environmental damage. If necessary, decontaminate fire-response equipment with soap and water solution. For large releases, consider evacuation. Refer to the North American Emergency Response Guidebook (Guide #130) for additional guidance.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel.

Minimum Personal Protective Equipment should be Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemical resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus. Monitor the surrounding area for combustible vapor levels. Combustible vapor levels must be below 10% of the LEL for Benzene (LEL = 1.3%) before personnel are permitted to enter the area. If necessary, ventilate area.

Monitoring should be done for the levels of Benzene and oxygen. Colorimetric tubes are available to detect the presence of Benzene. Levels of Benzene should be below levels listed in Section 2 (Composition and Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

Eliminate all sources of ignition before clean-up operations begin. Use non-sparking tools. Absorb spilled liquid with activated carbon, polypads or other suitable absorbent materials. Prevent material from entering sewer or confined spaces. Decontaminate the area thoroughly. Place all spill residue in an appropriate container and seal. If necessary, decontaminate spill-response equipment with soap and water solution. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

THIS IS AN EXTREMELY FLAMMABLE, TOXIC LIQUID: Protection of all personnel and the area must be maintained. All responders must be adequately protected from exposure.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Benzene ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling this material. Remove contaminated clothing immediately.

Note: Refer to the OSHA Benzene Standard (29 CFR 1910.1028) for specific requirements associated with the use of Benzene. The Action Level for Benzene is 0.5 ppm as an 8-hour, time-weighted average. In workplaces where employees are exposed above the Action Level, the OSHA requirements for monitoring, establishment of regulated areas, methods of compliance, respiratory protection, emergency response protocol, medical surveillance, training and record keeping must be followed.

STORAGE AND HANDLING PRACTICES: Entrances to regulated areas (as defined by the OSHA Benzene Standard) must be posted with signs which reads as follows:

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE- NO SMOKING
AUTHORIZED PERSONNEL ONLY

All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by Benzene. Use in a well-ventilated location. Cylinders of Benzene must be properly labeled. If Benzene is used in other types of containers, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for flammable liquids.

Store cylinders of Benzene in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Do not allow area where cylinders are stored to exceed 52°C (125°F). Material should be stored in secondary containers, or in a diked area, as appropriate. Store containers away from incompatible chemicals. Keep container tightly closed when not in use. Storage areas should be made of fire-resistant materials. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Refer to NFPA 30, Flammable and Combustible Liquids Code, for additional information on storage.

Empty containers may contain residual flammable liquid or vapors. Therefore, empty containers should be handled with care. Do not expose "empty" containers to welding touches, or any other source of ignition.

SPECIAL PRECAUTIONS FOR HANDLING CYLINDERS: Protect cylinders of Benzene against physical damage. If appropriate, cylinders should be stored in an up-right position. Cylinders should be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to situations in which cylinders are being used:

Before Use: If appropriate, move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Benzene. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Bulletin SB-2 "*Oxygen Deficient Atmospheres*".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use Benzene in areas where adequate ventilation is provided. Decontaminate equipment using soapy water before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside. Where appropriate, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Ensure eyewash/safety shower stations are available near areas where Benzene is used.

RESPIRATORY PROTECTION: Maintain exposure levels of Benzene below the levels listed in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Benzene levels exceed exposure limits and if oxygen level is below 19.5% or during emergency response to a release of Benzene. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH respiratory protection recommendations are for Benzene.

CONCENTRATION	RESPIRATORY EQUIPMENT
At Concentrations Above the NIOSH REL, or Where there is no REL, at any Detectable Concentration:	Positive-pressure, full facepiece SCBA or positive pressure, full-facepiece Supplied Air Respirator (SAR) with an auxiliary positive pressure SCBA.
Escape:	Gas mask with organic vapor cartridge or escape-type SCBA should be used.

The IDLH concentration for Benzene is 500 ppm. The carcinogenic effects of Benzene were not considered by NIOSH in determination of the IDLH.

NOTE: In areas which exceed the OSHA Action Level of Benzene, the respirator selection guidelines in the Benzene Standard [29 CFR 1910.1028 (g)] apply.

EYE PROTECTION: Splash goggles or safety glasses. Face-shields should be worn if contact with the liquid is anticipated.

HAND PROTECTION: Wear leather gloves for handling of cylinders of Benzene. Wear chemically impervious gloves appropriate for Benzene for industrial use. Gloves should have a resistance to breakthrough greater than 8 hours, such as polyvinyl alcohol, Barricade™ or Responder™. **Butyl rubber, natural rubber, neoprene, nitrile rubber, or polyethylene, polyvinyl chloride, Saranex™, Chemrel™ are not recommended.** Use triple gloves for spill response (see Section 6, Accidental Release Measures).

BODY PROTECTION: Use body protection appropriate for task. An impervious, full-body, encapsulating suit may be necessary for some operations involving Benzene. Safety shoes are recommended when handling cylinders.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): 2.7
SPECIFIC GRAVITY(@ 68°F (20°C) (water = 1): 0.877
SOLUBILITY IN WATER @ 77°F (25°C): 180 mg/mL
EVAPORATION RATE (diethyl ether = 1): 2.8
ODOR THRESHOLD: 97 ppm(detection); 97 ppm (recognition)
pH: Not applicable.
FREEZING/MELTING POINT: 5.5°C (42°F)
BOILING POINT: 80°C (176°F)
SPECIFIC VOLUME: Not applicable.
EXPANSION RATIO Not applicable.
LOG COEFFICIENT WATER/OIL DISTRIBUTION: Log P (oct) = 1.18-1.9; 2.13; 2.15
VAPOR PRESSURE @ 68°F (20°C): 75 mm Hg: 10 kPa

APPEARANCE AND COLOR: Colorless, flammable liquid, with a characteristic aromatic hydrocarbon odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor of Benzene is not a good warning property as a the odor threshold is above the TLV.

10. STABILITY and REACTIVITY

STABILITY: Normally stable.

DECOMPOSITION PRODUCTS: If Benzene is involved in a fire, it may ignite to yield toxic fumes of carbon monoxide, carbon dioxide, irritating aldehydes and ketones.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Benzene becomes spontaneously flammable in the presence of sodium peroxide and potassium peroxide. Benzene can explode on contact with chromic anhydride, permanganic acid and chlorine.

10. STABILITY and REACTIVITY (Continued)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE (Continued): Benzene can react vigorously with oxidizing materials. Benzene may react violently or explosively with risk of fire with nitric acid, ozone, diborane, interhalogens (e.g., bromine trifluoride, bromine pentafluoride, chloride trifluoride, iodine pentafluoride, iodine heptafluoride), dioxygen difluoride, dioxygenyl tetrafluoroborate, permanganic acid, peroxodifsulfuric acid, peroxomonosulfuric acid. Benzene will react with nitryl perchlorate, causing a slight explosion and flash. Benzene will react vigorously with uranium hexafluoride. Benzene will attack rubber and plastics.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid contact with incompatible materials, sparks, flame static discharge and other sources of ignition. Avoid exposing cylinders to extremely high temperatures, which could cause the cylinders to rupture or burst.

PART III *How can I prevent hazardous situations from occurring?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is available for Benzene.

Skin-Rabbit, adult 15 mg/24 hours open Mild irritation effects
Skin-Rabbit, adult 20 mg/24 hours Moderate irritation effects
Eye effects-Rabbit, adult 88 mg Moderate irritation effects
Eye effects-Rabbit, adult 2 mg/24H Severe irritation effects
oms-Human: lymphocyte 5 µmol/L
Microsomal Mutagenitlcity Assay-Mouse: embryo 2500 mg/L
Oral-Mouse TDLo: 6500 mg/kg (female 8-12 days post): Reproductive effects Teratogenesis, Carcinogenesis, and Mutagenesis
Inhalation-Mouse TCLo: 5 ppm (female 6-15 days post): Teratogenic effects
Inhalation-Man TCLo: 200 mg/m^3/78 weeks -intermittent: Carcinogenic effects, Blood effects
Inhalation-Human TCLo: 10 ppm/8 hours /10 years-intermittent: Carcinogenic effects, Blood effects
Oral-Rat TDLo: 52 g/kg/52 weeks - intermittent: Carcinogenic effects
Inhalation-Rat TCLo: 1200 ppm/6 hours/10 weeks - intermittent: Equivocal tumorigenic agent
Oral-Mouse TDLo :18,250 mg/kg/2 years - continuos: Carcinogenic effects
Inhalation-Human TC :8 ppb/4 weeks- intermittent: Carcinogenic effects, Blood effects
Inhalation-Dog, adult LCLo: 146,000 mg/
Inhalation-Cat, adult LCLo: 170,000 mg/m^3
Inhalation-Human TC: 10 mg/m 3/11 years- intermittent: Carcinogenic effects, Blood effects
Inhalation-Mouse TCLo: 300 ppm/6 hours/16 weeks-intermittent: Equivocal tumorigenic agent
Skin-Mouse TDLo: 1200 g/kg/49 weeks - intermittent: Neoplastic effects
Intraperitoneal-Mouse TDLo: 1200 mg/kg/8 weeks - intermittent: Neoplastic effects
Inhalation-Man TC: 150 ppm/11 years - intermittent: Carcinogenic effects, Blood effects
Inhalation-Mouse TC :1200 ppm/6 hours/10 weeks - intermittent: Equivocal tumorigenic agent
Oral-Mouse TD: 2400 mg/kg/8 weeks - intermittent: Neoplastic effects
Inhalation-Mouse TC: 300 ppm/6 hours/16 weeks intermittent: Carcinogenic effects
Inhalation-Human LCLo :2 pph/5 minutes
Oral-Man LDLo: 50 mg/kg
Inhalation-Human LCLo: 20,000 ppm/5
Inhalation-Man TCLo: 150 ppm/1 year - intermittent: Blood effects
Inhalation-Human TCLo: 100 ppm
Intravenous-Rabbit, adult LDLo :88 mg/kg
Inhalation-Human LCLo: 65 mg/m^3/5 years: Blood effects
Oral-Rat LD50: 3306 mg/kg
Inhalation-Rat LC50: 10,000 ppm/7 hours
Intraperitoneal-Rat LD50 :2890 µg/kg
Oral-Mouse LD50: 4700 mg/kg
Inhalation-Mouse LC50: 9980 ppm
Intraperitoneal-Mouse LD50: 340 mg/kg
Oral-Dog, adult LDLo: 2000 mg/kg
Subcutaneous-Mouse TDLo 600 mg/kg/17 weeks - intermittent: Equivocal tumorigenic agent
Parenteral-Mouse TDLo: 670 mg/kg/19 weeks - intermittent: Equivocal tumorigenic agent
Inhalation-Human TC: 150 ppm/15 minutes /8 years - intermittent: Carcinogenic effects, Blood effects
Oral-Rat TD: 52 g/kg/1 years - intermittent: Carcinogenic effects
Oral-Rat TD: 10 g/kg/52 weeks - intermittent: Carcinogenic effects
Inhalation-Man TC :600 mg/m^3/4 years - intermittent: Carcinogenic effects, Blood effects

Additional Information on Benzene: Because of the chronic toxicity effects associated with Benzene, additional information is provided, as follows:

EFFECTS ON THE BLOOD AND BLOOD-FORMING ORGANS: Extensive studies have conclusively proven that oral and inhalation exposure to benzene causes severe effects on the blood system, including damaging the bone marrow where new blood cells are formed. Most studies report a decrease in hemoglobin, hematocrit, red and white blood cells, platelets and/or changes in the cells. Effects of varying severity have been demonstrated with both intermittent and continuous exposures to concentrations as low as 10 ppm for 24 weeks.

EFFECTS ON THE IMMUNE SYSTEM: Studies have also conclusively shown that benzene causes harmful changes to the immune system which protects the body from disease. Benzene has decreased the number of mature B- and T-lymphocytes (white blood cells which produce disease-fighting antibodies). Exposure of mice to 300 ppm for 6 to 23 weeks resulted in a decrease in the number of mature B- and T-lymphocytes. Rats and mice exposed orally to 25 to 200 mg/kg/day for 2 years had significantly reduced white blood cells and lymphocytes.

11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: Benzene is listed as follows:

BENZENE: ACGIH-A2 (Suspected Human Carcinogen); EPA-A (Human Carcinogen); IARC-1 (Carcinogenic to Humans); MAK-A1 (Capable of Inducing Malignant Tumors/Experience with Humans); NIOSH-X (Carcinogen); NTP-1 (Known to be a Carcinogen); OSHA-X (Carcinogen); Cal-OSHA (Carcinogen).

IRRITANCY OF PRODUCT: Benzene is irritating to the skin, eyes, and other contaminated tissue.

SENSITIZATION OF PRODUCT: Benzene is not known to cause respiratory system or skin sensitization in humans. Cardiac sensitization to stimulants (e.g., epinephrine, ephedrine) is a possible result of severe or chronic overexposure.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Benzene on the human reproductive system.

Mutagenicity: Human mutation data are available for Benzene. These data were obtained from individuals who were exposed at levels which produced changes in the blood system.
Embryotoxicity: Benzene is not reported to cause embryotoxic effects in humans.
Teratogenicity: Benzene is not reported to cause teratogenic effects in humans. Teratogenic data are available from clinical studies involving test animals exposed to relatively high doses of Benzene. Fetotoxic effects (e.g., reduced birth weight and/or minor skeletal variations) were observed at exposures above 50 ppm.
Reproductive Toxicity: Data on reproductive effects on ovaries and testes are available from clinical studies involving test animals exposed to relatively high doses of Benzene. These data were obtained at doses which caused toxic effects on other organs.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing blood system disorders, respiratory conditions, central nervous, liver, kidney, and cardio-vascular conditions may be aggravated by severe or chronic overexposure to Benzene. Skin disorders may also be aggravated by exposures to Benzene.

RECOMMENDATIONS TO PHYSICIANS: The following guidelines are derived from "Clinical Toxicology of Commercial Chemical Products" (5th edition, 1984).

- Check for signs of impending pulmonary edema.
- Because of the aspiration hazard, avoid emetic drugs, whenever practical.
- For overexposures in which emesis is advisable: If the patient is not drowsy, comatose, or in respiratory difficulty, induce vomiting. If necessary, as an alternative treatment, remove Benzene from the stomach via gastric lavage. One or two ounces of mineral oil may be instilled and left in the stomach at the completion of lavage.
- Avoid epinephrine because of its possible adverse effect on the sensitized myocardium. Avoid all digestible fats, oils and alcohol,, which may promote the absorption of Benzene in the intestinal system.
- If eyes or skin are affected, wash thoroughly and apply a bland analgetic ointment.
- Because of the possibility of ventricular fibrillation, monitor the ECG continuously and be prepared to administer external cardiac massage.

Refer to the OSHA Benzene Standard [29 CFR 1910.1028; paragraph(i) and Appendix C] for specific information on Medical Surveillance requirements (i.e. for the general physical exam, medical history, specific tests, and re-examination protocol).

BIOLOGICAL EXPOSURE INDICES (BEIs): The following Biological Exposure Indices (BEIs) are currently applicable for Benzene.

BIOLOGICAL EXPOSURE INDICES (BEIs) for Benzene are as follows:		
CHEMICAL DETERMINANT	SAMPLING TIME	BEI
BENZENE • Total phenol in urine • Benzene in exhaled air: mixed-exhaled end-exhaled	• End of shift • Prior to next shift	• 50 mg/g creatinine • 0.08 ppm • 0.12 ppm

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Benzene will be degraded over time into other organic compounds. The following environmental data are available for Benzene.

BENZENE: K_{ow} = 2.13. Water Solubility = 1791 mg/L. BCF (*Anguilla japonica*, eels) = 3.5. BCF (*Clupea harengus Pallasi*, pacific herring) = 4.4. BCF (goldfish) = 4.3. BCF, benzene = 24 (estimated). If benzene is released into the soil, it will be volatilized near the surface or it will leach to the groundwater. No degradation of benzene (BOD) was reported in coarse-filtered Lake Superior harbor water incubated at 21°C for 12 days. In the marine eco-system, biodegradation occurs from 2 days to 2 weeks in the summer and spring, respectively. The half-life of Benzene in estuarine water was 6 days, as measured by $^{14}CO_2$ produced. Biodegradation half-lives of 28 and 16 days were reported in die-away tests for degradation of up to 3.2 UL/L benzene using groundwater and Lester River water, respectively, under aerobic conditions. In a base-rich para-brownish soil, 20 ppm benzene was 24% degraded in one week, 44% in 5 weeks and 47% in 10 weeks. It is not expected to adsorb to sediment nor bioconcentrate in aquatic organisms.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Benzene may be harmful or fatal to contaminated plant and animal-life (especially if large quantities of Benzene are released). Refer to Section 11 (Toxicology Information). Additional information is available on the effects of Benzene on plants as follows:

Benzene is lethal to plants at high concentrations (GT 15600 ppm in air) and short (30 minutes) exposure times. In all species studied recovery was complete upon removal from exposure to sub-lethal concentrations.

Plant growth and rooting is stimulated by aqueous solutions of low benzene concentrations (0.01-0.10 saturated). Aqueous solutions containing high concentrations (0.10-0.15% Benzene) inhibit growth and interfere with metabolism and cell division.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Benzene can be harmful or fatal to contaminated aquatic plant and animal life. Benzene floats on water, and can potentially form slicks which are capable of creating oxygen-deprived waterways which can contaminate coastal and shore life. The following aquatic toxicity data are available for Benzene.

LC_{100} (*Tetrahymena pyriformis*, ciliate) = 12.8 mmol/L/24 hours
LC_{50} (*Palaemonetes pugio*, grass shrimp) = 27 ppm/96 hours
LC_{50} (*Cancer magister*, crab larvae, stage 1) = 108 ppm/96 hours
LC_{50} (*Crangon franciscorum*, shrimp) = 20 ppm/96 hours
LC_{50} (*Poecilia reticulata*, guppy) = 63 ppm/14 days
LC_{50} (*Morone saxatilis*, bass) = 5.8 to 10.9 ppm/96 hours
LC_{50} (*Salmo trutta*, brown trout yearling) = 12 mg/L/1-hour
LC_{50} (*Ambystoma mexicana*, mexican axolotl salamander, 3-4 weeks after hatching) = 370 mg/L/48 hours
LC_{50} (clawed toad, 3-4 weeks after hatching) = 190 mg/L/48 hours
LD_{50} (*Carassium auratus*, goldfish) = 46 mg/L/24-hours
LD_{50} (*Lepomis macrochirus*, bluegill sunfish) = 60 mg/L/2-hours
LC (*Daphnia magna*) highest no adverse level = 98 mg/L
Effect level (blue crab) = 1 mg/L
EC_{50} (freshwater green algae, *Ankistrodesmus falccatus*) = 310 mg (3.97 mmol/L)
Photosynthetic carbon fixation (*selenastrum capricornutum*) = 100, 95, 84, 5; for 24 hour exposure to 0, 10, 100 Or 1000 mg Benzene/L
Growth inhibition (*Chlorella vulgaris*) = significant for 25-1744 ppm Benzene
Light saturated photosynthesis relative rates (*Nitzschia palea*, freshwater diatom) = 100, 61, 38, 13; exposure for 2 hours to 0, 175, 350, 520 mg Benzene/L
Growth inhibition (*Skeletonema costatum*) = at 20 mg/L

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with residual product to Airgas Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Benzene
HAZARD CLASS NUMBER and DESCRIPTION:	3 (Flammable Liquid)
UN IDENTIFICATION NUMBER:	UN 1114
PACKING GROUP:	PG II
DOT LABEL(S) REQUIRED:	Flammable Liquid

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 130

MARINE POLLUTANT: Benzene is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments. Also, , there is an additional Hazard Class: 9.2 (Substance Hazardous to the Environment).

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Benzene is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows:

COMPONENT	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Benzene	NO	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITIES (RQ): 10 lb; RCRA Code = U019.

CANADIAN DSL/NDSL INVENTORY STATUS: Benzene is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Benzene is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Benzene is subject to the requirements of CFR 29 1910.1028, the OSHA Benzene Standard. The Action Level for Benzene is 0.5 ppm as an 8-hour, time-weighted average under this regulation. The EPA is promulgating water regulations for certain volatile synthetic organic chemicals. Specifically, this notice promulgates a maximum contaminant level for Benzene at 0.005 mg/L. Benzene is not listed in Appendix A as a highly hazardous chemical, per 29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals. Under this regulation, however, any process that involves a flammable liquid on-site, in one location, in quantities of 10,000 lbs (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

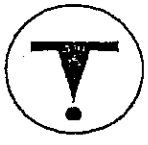
U.S. STATE REGULATORY INFORMATION: Benzene is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Benzene.
California - Permissible Exposure Limits for Chemical Contaminants: Benzene.
Florida - Substance List: Benzene.
Illinois - Toxic Substance List: Benzene.
Kansas - Section 302/313 List: Benzene.
Massachusetts - Substance List: Benzene.
Michigan Critical Materials Register: Benzene.
Minnesota - List of Hazardous Substances: Benzene.
Missouri - Employer Information/Toxic Substance List: Benzene.
New Jersey - Right to Know Hazardous Substance List: Benzene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Benzene.
Pennsylvania - Hazardous Substance List: Benzene.
Rhode Island - Hazardous Substance List: Benzene.
Texas - Hazardous Substance List: Benzene.
West Virginia - Hazardous Substance List: Benzene.
Wisconsin - Toxic and Hazardous Substances: Benzene.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Benzene is listed on the California Proposition 65 Lists. WARNING: Benzene is known to the State of California to cause cancer.

LABELING: DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR CAN CAUSE FLASH FIRE. FLASH POINT = -11°C (12°F). HARMFUL IF INHALED. HARMFUL OR FATAL IF SWALLOWED. PROLONGED OR REPEATED SKIN CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CAN CAUSE CENTRAL NERVOUS SYSTEM EFFECTS. CHRONIC EXPOSURE MAY CAUSE LEUKEMIA AND CAN CAUSE ADVERSE EFFECTS ON THE BLOOD SYSTEM, LIVER, KIDNEYS, REPRODUCTIVE SYSTEM. CAN CAUSE DEATH IF TOO MUCH IS BREATHED. ASPIRATION HAZARD IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Avoid contact with skin and clothing. Avoid exposure to vapor. Wash thoroughly after handling. FIRST-AID: In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if irritation develops or persists. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of fire, use water fog, foam, dry chemical, or CO_2. In case of spill: Absorb spill with inert materials (e.g. activated carbon, dry sand). Flush residual spill with water. Consult Material Safety Data Sheet for additional information.

CANADIAN WHMIS SYMBOLS: Class B2: Flammable Liquid.
Class D2A/D2B: Material Causing Other Toxic Effects



16. OTHER INFORMATION

PREPARED BY:

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619/565-0302

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (TWA), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (C). Skin absorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration. PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. The DFG - MAK is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. NIOSH is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (OSHA). NIOSH issues exposure guidelines called Recommended Exposure Levels (RELs). When no exposure guidelines are established, an entry of NE is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: 0 (minimal acute or chronic exposure hazard); 1 (slight acute or chronic exposure hazard); 2 (moderate acute or significant chronic exposure hazard); 3 (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); 4 (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: 0 (minimal hazard); 1 (materials that require substantial pre-heating before burning); 2 (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); 3 (Class IB and IC flammable liquids with flash points below 38°C [100°F]); 4 (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: 0 (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); 2 (materials that are unstable but do not detonate or which can react violently with water); 3 (materials that can detonate when initiated or which can react explosively with water); 4 (materials that can detonate at normal temperatures or pressures).
NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: 0 (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); 1 (materials that on exposure under fire conditions could cause irritation or minor residual injury); 2 (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); 3 (materials that can on short exposure could cause serious temporary or residual injury); 4 (materials that under very short exposure causes death or major residual injury).
NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: LD_{50} - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; LC_{50} - Lethal Concentration (gases) which kills 50% of the exposed animals; ppm concentration expressed in parts of material per million parts of air or water; mg/m^3 concentration expressed in weight of substance per volume of air; mg/kg quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: IARC - the International Agency for Research on Cancer; NTP - the National Toxicology Program, RTECS - the Registry of Toxic Effects of Chemical Substances, OSHA and CAL/OSHA. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include TDLo, the lowest dose to cause a symptom and TCLo the lowest concentration to cause a symptom; TDo, LDLo, and LDo, or TC, TCo, LCLo, and LCo, the lowest dose (or concentration) to cause lethal or toxic effects. BEI - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. EPA is the U.S. Environmental Protection Agency. WHMIS is the Canadian Workplace Hazardous Materials Information System. DOT and TC are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (SARA); the Canadian Domestic/Non-Domestic Substances List (DSL/NDSL); the U.S. Toxic Substance Control Act (TSCA); Marine Pollutant status according to the DOT; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund); and various state regulations.

MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
959 ROUTE 46 EAST
PARSIPPANY, NEW JERSEY 07054-0624

EMERGENCY CONTACT:
CHEMTREC 1-800-424-9300
INFORMATION CONTACT:
973-257-1100

SUBSTANCE: ETHYL BENZENE

TRADE NAMES/SYNONYMS:
MTG MSDS 185; BENZENE, ETHYL-; EB; PHENYLETHANE; ETHYLBENZENE; ETHYLBENZOL; ALPHA-METHYLTOLUENE; UN 1175; C8H10; MAT08780

CHEMICAL FAMILY: hydrocarbons, aromatic

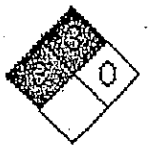
CREATION DATE: Jan 24 1989
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: ETHYL BENZENE
CAS NUMBER: 100-41-4
PERCENTAGE: 100

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=0



EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: aromatic odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, suspect cancer hazard (in animals)
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation (possibly severe), chest pain, difficulty breathing, headache, drowsiness, dizziness, loss of coordination, coma
LONG TERM EXPOSURE: irritation, headache, drowsiness, emotional disturbances, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation

EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: nausea, vomiting, stomach pain, aspiration hazard
LONG TERM EXPOSURE: no information on significant adverse effects

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage and activated charcoal slurry.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: 59 F (15 C) (CC)
LOWER FLAMMABLE LIMIT: 0.8%
UPPER FLAMMABLE LIMIT: 6.7%
AUTOIGNITION: 810 F (432 C)

FLAMMABILITY CLASS (OSHA): IB

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Stay upwind and keep out of low areas.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Cover with absorbent sheets, spill-control pads or pillows. Neutralize. Collect with absorbent into suitable container. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
ETHYL BENZENE:
100 ppm (435 mg/m3) OSHA TWA
125 ppm (543 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
100 ppm ACGIH TWA
125 ppm ACGIH STEL
100 ppm (435 mg/m3) NIOSH recommended TWA 10 hour(s)
125 ppm (545 mg/m3) NIOSH recommended STEL

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye

wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
800 ppm
Any chemical cartridge respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any supplied-air respirator.
Any self-contained breathing apparatus with a full facepiece.
Escape -
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: aromatic odor
MOLECULAR WEIGHT: 106.17
MOLECULAR FORMULA: C-H3-C-H2-C6-H5
BOILING POINT: 277 F (136 C)
FREEZING POINT: -139 F (-95 C)
VAPOR PRESSURE: 7.1 mmHg @ 20 C
VAPOR DENSITY (air=1): 3.66
SPECIFIC GRAVITY (water=1): 0.8670
WATER SOLUBILITY: 0.015%
PH: Not available
VOLATILITY: 100%
ODOR THRESHOLD: 140 ppm
EVAPORATION RATE: <1 (butyl acetate=1)
VISCOSITY: 0.64 cP @ 25 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, benzene, sulfur dioxide, carbon tetrachloride
Insoluble: ammonia

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, bases, oxidizing materials, combustible materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

ETHYL BENZENE:
IRRITATION DATA:
15 mg/24 hour(s) open skin-rabbit mild; 500 mg eyes-rabbit severe
TOXICITY DATA:
17800 ul/kg skin-rabbit LD50; 3500 mg/kg oral-rat LD50
CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Sufficient Evidence, Group 2B; ACGIH: A3 -Animal Carcinogen
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: dermal absorption
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: kidney disorders, liver disorders, respiratory disorders, skin disorders and allergies
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: May cross the placenta.

SECTION 12 ECOLOGICAL INFORMATION

FATE AND TRANSPORT:
KOW: 154881.66 (log = 5.190) (estimated from water solubility)

KOC: 43651.58 (log = 4.640) (estimated from water solubility)

HENRY'S LAW CONSTANT: 6.6 E -3 atm-m3/mol

BIOCONCENTRATION: 36.39 (estimated from water solubility)

AQUATIC PROCESSES: 2.6723816 hours (River Model: 1 m deep, 1 m/s flow, 3 m/s wind)

ENVIRONMENTAL SUMMARY: Relatively non-persistent in the environment. Not expected to leach through the soil or the sediment. Accumulates very little in the bodies of living organisms. Highly volatile from water.

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Ethylbenzene
ID NUMBER: UN1175
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Ethylbenzene
ID NUMBER: UN1175
CLASSIFICATION: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
ETHYL BENZENE: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
ETHYL BENZENE

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: B2.

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES
SECTION 3 HAZARDS IDENTIFICATION
SECTION 15 REGULATORY INFORMATION

MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
959 ROUTE 46 EAST
PARSIPPANY, NEW JERSEY 07054-0624

EMERGENCY CONTACT:
CHEMTREC 1-800-424-9300
INFORMATION CONTACT:
973-257-1100

SUBSTANCE: TOLUENE

TRADE NAMES/SYNONYMS:
MTG MSDS 134; METHYLBENZENE; TOLUOL; METHYLBENZOL; PHENYLMETHANE; METHACIDE; RCRA U220; UN 1294; C7H8; MAT23590; RTECS XS5250000

CHEMICAL FAMILY: hydrocarbons, aromatic

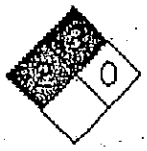
CREATION DATE: Jan 24 1989
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TOLUENE
CAS NUMBER: 108-88-3
PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=0



EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: distinct odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, nerve damage
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, metallic taste, nausea, headache, drowsiness, symptoms of drunkenness, tingling sensation, dilated pupils, kidney damage, liver damage, nerve damage
LONG TERM EXPOSURE: ringing in the ears, stomach pain, chest pain, irregular heartbeat, fainting, menstrual disorders, blood disorders, liver enlargement, paralysis, reproductive effects, brain damage, coma
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), tearing
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation, aspiration hazard
LONG TERM EXPOSURE: reproductive effects

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: 39 F (4 C) (CC)
LOWER FLAMMABLE LIMIT: 1.2%
UPPER FLAMMABLE LIMIT: 7.1%
AUTOIGNITION: 896 F (480 C)
FLAMMABILITY CLASS (OSHA): IB

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Stay upwind and keep out of low areas.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material. Collect with absorbent into suitable container.

WATER RELEASE:
Absorb with activated carbon. Collect spilled material using mechanical equipment. Cover with absorbent sheets, spill-control pads or pillows. Apply detergents, soaps, alcohols or another surface active agent. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Keep separated from incompatible substances. Grounding and bonding required. Store in a tightly closed container. Store in a cool, dry place.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TOLUENE:
200 ppm OSHA TWA
300 ppm OSHA ceiling
500 ppm OSHA peak 10 minute(s)
100 ppm (377 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
150 ppm (565 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
50 ppm ACGIH TWA (skin)
100 ppm (375 mg/m3) NIOSH recommended TWA 10 hour(s)
150 ppm (560 mg/m3) NIOSH recommended STEL

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
500 ppm
Any chemical cartridge respirator with organic vapor cartridge(s).
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any supplied-air respirator.
Any self-contained breathing apparatus with a full facepiece.
Escape -
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
ODOR: distinct odor
MOLECULAR WEIGHT: 92.14
MOLECULAR FORMULA: C6-H5-C-H3
BOILING POINT: 232 F (111 C)
FREEZING POINT: -139 F (-95 C)
VAPOR PRESSURE: 22 mmHg @ 20 C
VAPOR DENSITY (air=1): 3.14
SPECIFIC GRAVITY (water=1): 0.8669
WATER SOLUBILITY: 0.05% @ 20 C
PH: Not available
VOLATILITY: 100%
ODOR THRESHOLD: 10-15 ppm
EVAPORATION RATE: 2.24 (butyl acetate=1)
VISCOSITY: 0.560 mPa.s @ 25 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, benzene, acetone, ligroin, chloroform, acetic acid, carbon disulfide

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may

rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: halogens, combustible materials, acids, oxidizing materials, metal salts

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon, hydrocarbons

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

TOLUENE:
IRRITATION DATA:
300 ppm eyes-human; 435 mg skin-rabbit mild; 500 mg skin-rabbit moderate; 20 mg/24 hour(s) skin-rabbit moderate; 870 ug eyes-rabbit mild; 2 mg/24 hour(s) eyes-rabbit severe; 100 mg/30 second(s) rinsed eyes-rabbit mild; 250 ul/24 hour(s) skin-pig mild
TOXICITY DATA:
49 gm/m3/4 hour(s) inhalation-rat LC50; 14100 ul/kg skin-rabbit LD50; 636 mg/kg oral-rat LD50
CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Evidence Suggesting Lack of Carcinogenicity, Group 3; ACGIH: A4 -Not Classifiable as a Human Carcinogen
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation, dermal absorption
TARGET ORGANS: nervous system
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 8110 ug/L 96 hour(s) LC50 (Mortality) Coho salmon,silver salmon (Oncorhynchus kisutch)

INVERTEBRATE TOXICITY: 6000 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 9400 ug/L 8 hour(s) EC50 (Growth) Green algae (Selenastrum capricornutum)

FATE AND TRANSPORT:
BIOCONCENTRATION: 1716 ug/L 6 hour(s) BCF (Residue) Water flea (Daphnia magna) 1.5 ug/L

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U220.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Toluene
ID NUMBER: UN1294
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Toluene
ID NUMBER: UN1294
CLASSIFICATION: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
TOLUENE: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
TOLUENE

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
TOLUENE
Developmental toxicity (Jan 01, 1991)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: BD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES
SECTION 15 REGULATORY INFORMATION

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Vopak

Material Safety Data Sheet

LA1669
Xylene

Revision Date: 02/24/2001 Date of Printing: 04/26/2002

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Id: LA1669
Product Name: Xylene
Synonyms: Xylol Dimethylbenzene.
Chemical Family: Hydrocarbon
Application: Chemical intermediate.

Distributed By:

Vopak Canada Ltd.
Van Horne Way
Richmond, BC
V6X 1W5

Vopak USA.
6100 Carillon Point
Kirkland, WA 98003
USA.

Prepared By: The Safety, Health and Environment Department of Vopak Canada Ltd.

Emergency Telephone Number (CHEMTREC): (800) 424-9300

Telephone number for non-emergency questions concerning MSDS(Canada): (604) 303-2565
Vopak USA. Inc. Corporate Office Number: (425) 889-3400

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components:

Ingredients	Percent	LD50s and LC50s Route & Species:
Xylene, Mixture Of Isomers 1330-20-7	60-100	Inhalation LC50 Rat : 5000 ppm/4HOral LD50 Rat : 4300 mg/kgDermal LD50 Rabbit : >1700 mg/kg
Ethyl Benzene 100-41-4	10-30	Oral LD50 Rat : 3500 mg/kgDermal LD50 Rabbit : 17800 uL/kg

Notes: No additional remark.

3. HAZARDS IDENTIFICATION

Potential Acute Health Effects:

Eye Contact: Vapours are moderately irritating to the eyes.
Skin Contact: Causes moderate skin irritation.

Inhalation:	Vapours are moderately irritating to the respiratory passages. The liquid when accidently aspirated into the lungs can cause severe inflammation of the lung. In rare cases may sensitize heart muscle causing heart arrythmia. Solvent abusers exposed to high doses of aromatic solvents (e.g. toluene/xylene) show signs of hearing loss as well as damage to the brain, liver and kidney. Excessive exposure during pregnancy may be hazardous to the developing fetus.
Ingestion:	Harmful if swallowed.

4. FIRST AID MEASURES

Eye Contact:	Flush eyes with water for at least 15 minutes while holding eyelids open. Seek immediate medical attention.
Skin Contact:	Flush affected skin with gently flowing water for at least 20 minutes and remove contaminated clothing while rinsing. Wash contaminated skin with mild soap and water for 15 minutes. Obtain medical attention immediately.
Inhalation:	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:	Do NOT induce vomiting unless directed to do so by medical personnel. Guard against aspiration into lungs by having the individual turn on to their left side. Get immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.
Notes To Physician:	The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If more than 2.0 mL/kg has been ingested, vomiting should be induced with supervision. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Flash Point (C):	>24	(F):	>75
Flash Point Method:	Tag Closed Cup		
Autoignition Temperature (C):	527	(F):	980
Flammable Limits in Air - Lower (%):	1.1		
Flammable Limits in Air - Upper (%):	7		

Extinguishing Media:	Dry chemical. Carbon dioxide Foam Water mist
Special Exposure Hazards:	Vapour forms a flammable / explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Do not use water except as a fog. Product will float and can be reignited on surface of water. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure build-up which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Always stay away from ends of containers due to explosive potential. Fight fire from maximum distance. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus.
Special Protective Equipment:	Fire fighters should wear full protective clothing, including self-contained breathing equipment.

NFPA RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 3 , REACTIVITY 0

HMIS RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 3 , REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures:	Restrict access to unprotected personnel. Wear appropriate protective equipment.
Environmental Precautionary Procedure for Cleaning/Absorption:	Prevent from entering sewers, waterways or low areas. Consult local authorities. Eliminate all ignition sources. Isolate spill and stop leak where safe. Try to work upwind of spill. Avoid direct contact with material. Saturated clothing should be immediately removed to avoid flammability hazard. Wear appropriate breathing apparatus (if applicable) and protective clothing. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours; contain runoff. For large spills, remove by mechanical means and place in containers. For small spills, collect with non-combustible sorbent. Flush area with water to remove trace residue.

7. HANDLING AND STORAGE

Handling:	Flammable. Do not cut, drill, grind, weld or perform similar operations on or near containers. Vapours may accumulate and travel to distant ignition sources and flashback. Empty containers may contain hazardous product residues. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Hot surfaces may be sufficient to ignite liquid even in the absence of sparks or flames. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Do not pressurize drum containers to empty them. Avoid breathing vapours and prolonged or repeated contact with skin. Launder contaminated clothing prior to reuse. Use good personal hygiene. Air-dry contaminated clothing in a well ventilated area before laundering.
Storage:	Store in a cool, dry, well ventilated area, away from heat and ignition sources. Use explosion-proof ventilation to prevent vapour accumulation.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:	For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere. Local ventilation recommended where mechanical ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. Concentrations in air should be maintained below lower explosive limit at all times or below the recommended threshold limit value if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Electrical and mechanical equipment should be explosion-proof. Mechanical ventilation is recommended for all indoor situations to control fugitive emissions.
Respiratory Protection:	If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airbourne concentrations, use a NIOSH -approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.
Gloves:	Impervious gloves. Polyvinyl gloves. Viton gloves.
Skin Protection:	Impervious gloves (viton, polyvinyl alcohol) should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn.
Eyes:	Chemical safety goggles and or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.
Other Personal Protection Data:	Ensure that eyewash stations and safety showers are proximal to the work-station location.

Hazardous Components:

Ingredients	Percent	ACGIH 2000 - Time Weighted Averages	OSHA - Vacated PELs - Time Weighted Averages
Xylene, Mixture Of Isomers 1330-20-7	60-100	100 ppm TWA	100 ppm TWA; 435 mg/m³ TWA
Ethyl Benzene 100-41-4	10-30	100 ppm TWA	100 ppm TWA; 435 mg/m³ TWA

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Colourless
Odor:	Sweet Aromatic Odour
pH:	Not Available.
Specific Gravity:	0.871
Boiling Point (C):	137 - 143 (F): 278 - 289
Freezing Point (C):	>-48 (F): >-54
Vapor Pressure:	>5 mm Hg
Vapor Density:	3.7
% Volatile by Volume:	Not Available.
Evaporation Rate:	0.72
Solubility:	Negligible water solubility. Soluble in organic solvents.
VOCs (lbs/gallon):	Not Available.
Viscosity:	Not Available.
Molecular Weight:	106.2

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	Avoid excessive heat, open flames and all ignition sources.
Materials to Avoid:	Strong oxidizing agents.
Hazardous Decomposition Products:	Carbon monoxide. Carbon dioxide.
Additional Information:	Xylene will attack some forms of plastics, rubber and coatings.

11. TOXICOLOGICAL INFORMATION

Principle Routes of Exposure

Ingestion:	Harmful if swallowed.
Skin Contact:	Causes moderate skin irritation.
Inhalation:	Vapours are moderately irritating to the respiratory passages. The liquid when accidently aspirated into the lungs can cause severe inflammation of the lung. In rare cases may sensitize heart muscle causing heart arrythmia. Solvent abusers exposed to high doses of aromatic solvents (e.g. toluene/xylene) show signs of hearing loss as well as damage to the brain, liver and kidney. Excessive exposure during pregnancy may be hazardous to the developing fetus.
Eye Contact:	Vapours are moderately irritating to the eyes.
Aggravated Conditions:	Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Carcinogenicity Comment:	No additional information available.
Other:	Prolonged exposures to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged and repeated contact with the skin can cause defatting and drying of the skin resulting in skin irritation

and dermatitis.

Acute Test:

Acute Oral LD50:	Not Available.
Acute Dermal LD50:	Not Available.
Acute Inhalation LC50:	Not Available.
Primary Irritation Effect:	Causes skin and eye irritation. Respiratory disorders.
Carcinogenicity:	This product contains ethylbenzene. Ethylbenzene has been shown to cause cancer in laboratory animals. Toxicity tests carried out for chronic effects and mutagenicity have been negative.

Xylene, Mixture Of Isomers 60-100 1330-20-7
IARC - Group 3 (not classifiable) Listed

Ethyl Benzene 10-30 100-41-4
IARC - Group 2B (Possibly carcinogenic) Listed

Hazardous Components:

Ingredients	Percent	ACGIH 2000 - Carcinogens
Xylene, Mixture Of Isomers 1330-20-7	60-100	A4 - Not Classifiable as a Human Carcinogen
Ethyl Benzene 100-41-4	10-30	Not listed.

Genotoxicity:	Not Available.
Reproductive/Developmental Toxicity:	Not Available.
Teratogenicity:	Not Available.
Embryotoxicity:	High exposures to xylene in some animal studies, often at levels toxic to the mother, affected embryo/fetal development. The significance of this finding to humans is not known.
Mutagenicity:	Toxicity tests carried out for chronic effects and mutagenicity have been negative.

12. ECOLOGICAL INFORMATION

Mobility:	Not Available.
Persistence:	Not Available.
Bioaccumulative:	Not Available.
Ecotoxicological Information:	
Ecotoxicity - Fish Species Data	Not Available.
Acute Crustaceans Toxicity:	Not Available.
Ecotoxicity - Freshwater Algae Data	Not Available.
Chemical Fate Information:	Not Available.
Other Information:	Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams or public waterways. Block off drains and ditches. Spill areas must be cleaned and restored to original condition or to the satisfaction of authorities. May be harmful to aquatic life.

Biodegrades (slow). Rapid volatilization. Not expected to bioconcentrate.

13. DISPOSAL CONSIDERATIONS

Disposal of Waste Method:
Waste management priorities (depending on volumes and concentration of waste) are : 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration, 4. disposal at a licensed waste disposal facility. Do not attempt to combust waste on site. Incinerate at a licensed waste disposal site with approval of environmental authority.

Contaminated Packaging:
Empty containers should be recycled or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (U.S.):

DOT Shipping Name:	Xylenes
Hazard Class:	3
UN/NA Number:	UN1307
DOT Packing Group:	III
DOT Reportable Quantity (lbs):	100
Marine Pollutant:	No.

ICAO/IATA:

IATA Proper Shipping Name:	Xylenes
IATA Hazard Class:	3
UN/NA Number:	UN1307
Packing Group:	III
IATA Label:	Flammable liquid.
Remarks:	No additional remark.

IMDG:

IMDG Proper Shipping Name:	Xylenes
Hazard Class:	3
Packing Group:	III
EMS No.:	3-07
MFAG Table No.:	Not applicable.
Marine Pollutant:	No.
IMDG Flash Point (C):	17 - 23
IMDG Label:	Flammable liquid.
Remarks:	No additional remark.

TDG (Canada):

TDG Proper Shipping Name:	Xylenes
Hazard Class:	3
UN Number:	UN1307
Packing Group:	III
Note:	No additional remark.
Marine Pollutant:	No.

15. REGULATORY INFORMATION

U.S. TSCA Inventory Status:	Listed.
Canadian DSL Inventory Status:	Listed.
Canadian NDSL Inventory Status:	Not Listed.

U.S. Regulatory Rules

Xylene, Mixture Of Isomers 60-100 1330-20-7

CERCLA/SARA - Section 302:	Not Listed.
SARA (311, 312) Hazard Class:	Listed
CERCLA/SARA - Section 313:	Listed

Ethyl Benzene 10-30 100-41-4

CERCLA/SARA - Section 302:	Not Listed.
SARA (311, 312) Hazard Class:	Listed
CERCLA/SARA - Section 313:	Listed

California Proposition 65:	Not Listed.
MA Right to Know List:	Listed.
New Jersey Right-to-Know List:	Listed.
Pennsylvania Right to Know List:	Listed.
Canada - WHMIS Classification:	B2 FLAMMABLE LIQUIDS D2A VERY TOXIC MATERIALS D2B TOXIC MATERIALS

16. OTHER INFORMATION

The following sections have been revised: Nothing has been revised.

Additional Information: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS containsall the information required by the CPR.

Disclaimer: NOTICE TO READER:
Vopak, expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a Product Specification Sheet and/or a Certificate of Analysis. These can be obtained from your local Vopak Sales Office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Vopak makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Vopak's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

END OF MSDS

NFPA 704 (Section 16)

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Methyl tert-Butyl Ether (MTBE) MSDS No. 9922

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Apr-98)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000

SYNONYMS: 2-methoxy-2-methyl propane; Methyl t-butyl ether; MTBE; t-butyl methyl ether

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS (rev. Sep-94)

INGREDIENT NAME	EXPOSURE LIMITS	CONCENTRATION PERCENT BY WEIGHT
Methyl-tertiary butyl ether (MTBE) CAS NUMBER: 1634-04-4	OSHA PEL-TWA/STEL: None established ACGIH TLV-TWA: 40 ppm, A3	> 97%

MTBE ($C_5H_{12}O$) is used as an octane booster and oxygenate for unleaded gasoline.

3. HAZARDS IDENTIFICATION (rev. Apr-98; Tox-98)

EMERGENCY OVERVIEW

DANGER!

EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

Contact may cause eye, skin and mucous membrane irritation. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

EYES
Contact with the eye may cause slight to mild irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting, and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

INHALATION
Excessive exposure may cause irritation to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
This product has produced cancer, developmental and systemic toxicity in laboratory animals following repeated exposure. The significance of these results to human exposures has not been determined – see Section 11, Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash) conditions. Chronic respiratory disease, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Apr-98; Tox-98)

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES (rev. Nov-96)

FLAMMABLE PROPERTIES:

FLASH POINT:	-14 °F (-25 °C)
AUTOIGNITION TEMPERATURE:	AP 815 °F (435 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1B (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.6
UPPER EXPLOSIVE LIMIT (%):	8.4

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

This product burns with a blue flame which is often less visible than gasoline or other petroleum hydrocarbons flames.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam suitable for polar solvents. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended - refer to NFPA 11 "Low Expansion Foam ."

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Apr-98)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Apr-98)

HANDLING PRECAUTIONS

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Nov-96)

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as of E.I. DuPont Tychem ®, Barricade ®, or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Sep-94)

APPEARANCE

A clear, water-like liquid

ODOR

A sweet, ether-like odor.

ODOR THRESHOLD

Odor detectable at 0.05 ppm and recognizable at 0.13 ppm. Highly odorous.

BASIC PHYSICAL PROPERTIES

BOILING POINT:	131 °F (55 °C)
VAPOR PRESSURE:	7.8 PSI @ 100 °F (38 °C)
VAPOR DENSITY (air = 1):	3.1
SPECIFIC GRAVITY (H_2O = 1):	0.74
EVAPORATION RATE:	ND - probably high
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	AP 5% @ 68 °F (20 °C)

10. STABILITY and REACTIVITY (rev. Sep-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

INCOMPATIBLE MATERIALS
Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke), irritating aldehydes and ketones, and other toxic vapors.

11. TOXICOLOGICAL PROPERTIES (rev. Apr-98)

ACUTE EFFECTS

Acute Dermal:	LD50 (rabbit): >10 g/kg	Eye Irritation (rabbits):	mild to moderate
Acute Inhalation:	LC50 (rat): 35,000 ppm	Dermal irritation (rabbit):	slight
Acute Oral:	LD50 (rat): 4.0 ml/kg	Dermal Sensitization:	negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenic: IARC: NO NTP: NO OSHA: NO ACGIH: A3 (animal carcinogen)
MTBE has demonstrated some evidence of developmental toxicity in animal models.

MUTAGENICITY (genetic effects)
MTBE was positive in a single mutagenicity study following activation.

12. ECOLOGICAL INFORMATION (rev. Apr-98)

Keep out of sewers, drainage and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, MTBE will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. Refer to API Publication 4497, "Cost-Effective, Alternative Treatment Technologies For Reducing the Concentrations of Ethers and Alcohols in Groundwater."

13. DISPOSAL CONSIDERATIONS (rev. Apr-98)

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION (rev. Sep-94)

PROPER SHIPPING NAME:	Methyl tert-butyl ether
HAZARD CLASS AND PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 2398
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

15. REGULATORY INFORMATION (rev. Nov-96)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION
This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, to state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the federal, state and/or local level. Consult those regulations applicable to your facility / operation. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)
Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)
MTBE is a CERCLA hazardous substance and as such is subject to CERCLA and SARA federal reporting requirements. Reportable Quantity (pounds): 1000

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME	CONCENTRATION PERCENT BY WEIGHT
Methyl-tertiary butyl ether (MTBE) CAS NUMBER: 1634-04-4	> 97

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2, Subdivision B (Toxic by other means)

16. OTHER INFORMATION (rev. Nov-96)

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	High
	REACTIVITY:	0	Negligible
HMIS® HAZARD RATING	HEALTH:	1*	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Negligible
			* Chronic

SUPERSEDES MSDS DATED: 11/21/96

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than

N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212)642-4900
API	American Petroleum Institute 202)682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

MARATHON ASHLAND
Petroleum LLC

PRODUCT NAME: MAPLLC PETROLEUM CRUDE OIL
MARATHON MSDS NO: 0110MAR019

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

PRODUCT NAME:
MAPLLC PETROLEUM CRUDE OIL

SYNONYMS:
CRUDE OIL, MAPLLC; MAPLLC CRUDE OIL; MAPLLC PETROLEUM CRUDE OIL; PETROLEUM CRUDE OIL, MAPLLC

CHEM FAMILY: PETROLEUM HYDROCARBON
CHEM FORMULA: COMPLEX MIXTURE
PRODUCT CODE: NONE

MANUFACTURER / DISTRIBUTOR:
MARATHON ASHLAND PETROLEUM LLC
539 SOUTH MAIN STREET
FINDLAY OH 45840

EMERGENCY PHONE NUMBERS:
(877)627-5463
(800)424-9300

MSDS INFORMATION: (419)421-3070

MSDS REVISION DATE: 06/11/1998

INFORMATION SUPPLIED BY: CRAIG M. PARKER
MANAGER, TOXICOLOGY AND PRODUCT SAFETY

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2. COMPOSITION / INFORMATION ON INGREDIENTS

PRODUCT INFORMATION:

MAPLLC PETROLEUM CRUDE OIL (CAS # 8002-05-9) IS A/AN COMPLEX MIXTURE OF PARAFFINS, CYCLOPARAFFINS AND AROMATIC HYDROCARBONS. CAN CONTAIN MINOR AMOUNTS OF SULFUR, NITROGEN, AND OXYGEN COMPOUNDS AS WELL AS TRACE AMOUNTS OF HEAVY METALS SUCH AS NICKEL, VANADIUM AND LEAD. COMPOSITION VARIES DEPENDING ON SOURCE OF CRUDE.

	PERCENT RANGE	CAS NUMBER

COMPONENTS:

PETROLEUM CRUDE OIL	98.00-100.00	8002-05-9
TOLUENE	0.00- 5.00	108-88-3
XYLENE	0.00- 5.00	1330-20-7
HYDROGEN SULFIDE	0.00- 4.00	7783-06-4
SULFUR COMPOUNDS	0.00- 3.00	MIXTURE
NORMAL HEXANE	0.00- 3.00	110-54-3
BENZENE	0.00- 2.00	71-43-2

EXPOSURE GUIDELINES

	LIMIT	TYPE	SOURCE
PRODUCT:			
MAPLLC PETROLEUM CRUDE OIL	NONE ESTABLISHED		
COMPONENTS:			
PETROLEUM CRUDE OIL	NONE ESTABLISHED		
TOLUENE	50.00 PPM	8 HR TWA	ACGIH
	100.00 PPM	8 HR TWA	OSHA*
	150.00 PPM	STEL	OSHA*
XYLENE	100.00 PPM	8 HR TWA	ACGIH
	150.00 PPM	STEL	ACGIH
	100.00 PPM	8 HR TWA	OSHA*
	150.00 PPM	STEL	OSHA*
HYDROGEN SULFIDE	10.00 PPM	8 HR TWA	ACGIH
	15.00 PPM	STEL	ACGIH
	10.00 PPM	8 HR TWA	OSHA*
	15.00 PPM	STEL	OSHA*

* THE MANUFACTURER HAS VOLUNTARILY ELECTED TO REFLECT EXPOSURE LIMITS CONTAINED IN OSHA'S 1989 AIR CONTAMINANTS STANDARD IN ITS MSDS'S, EVEN THOUGH CERTAIN OF THOSE EXPOSURE LIMITS WERE VACATED IN 1992.

SULFUR COMPOUNDS	NONE ESTABLISHED		
NORMAL HEXANE	50.00 PPM	8 HR TWA	ACGIH
	500.00 PPM	8 HR TWA	OSHA
BENZENE	.50 PPM	8 HR TWA	ACGIH
	2.50 PPM	STEL	ACGIH
	1.00 PPM	8 HR TWA	OSHA
	5.00 PPM	STEL	OSHA

OSHA ACTION LEVEL 0.50 PPM (8 HR TWA)

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3. HAZARDS IDENTIFICATION

********** EMERGENCY OVERVIEW **********

PETROLEUM CRUDE OIL IS AMBER TO BLACK IN COLOR DEPENDING ON THE SOURCE. SOUR CRUDE POSSESSES A ROTTEN EGG OR SULFUR ODOR. CRUDE OIL IS A VOLATILE AND EXTREMELY FLAMMABLE LIQUID AND VAPORS MAY CAUSE FLASH FIRES. KEEP AWAY FROM HEAT, FLAME AND SOURCES OF IGNITION. CRUDE OIL CAN CONTAIN TOXIC LEVELS OF HYDROGEN SULFIDE VAPORS THAT ACCUMULATE IN THE VAPOR SPACES OF STORAGE AND TRANSPORT COMPARTMENTS. THESE VAPORS CAUSE EYE, SKIN, AND RESPIRATORY TRACT IRRITATION AND ASPHYXIATION. CRUDE OIL CAN ALSO CONTAIN SIGNIFICANT CONCENTRATIONS OF BENZENE WHICH HAS BEEN SHOWN TO CAUSE CANCER OR BE TOXIC TO BLOOD-FORMING ORGANS. IF SWALLOWED, THE VOLATILE COMPONENTS OF CRUDE OIL MAY GET SUCKED INTO THE LUNGS (ASPIRATED) AND CAUSE LUNG DAMAGE OR EVEN DEATH.

OSHA WARNING LABEL:

DANGER!
FLAMMABLE LIQUID
MAY VENT HARMFUL CONCENTRATIONS OF HYDROGEN SULFIDE (H2S) GAS
WHICH CAN CAUSE RESPIRATORY IRRITATION AND ASPHYXIATION.
CONTAINS BENZENE WHICH MAY CAUSE
CANCER OR BE TOXIC TO BLOOD-FORMING ORGANS.
ASPIRATION (INADVERTENT SUCTION) OF LIQUID INTO THE LUNGS
CAN PRODUCE CHEMICAL PNEUMONIA OR EVEN DEATH.

****

POTENTIAL HEALTH EFFECTS

EYE:

LIQUID OR VAPOR CONTACT MAY RESULT IN SLIGHT EYE IRRITATION.

SKIN:

PROLONGED AND REPEATED LIQUID CONTACT CAN CAUSE DERMATITIS, FOLLICULITIS OR OIL ACNE.

INHALATION:

VAPORS AND FUMES CAN CAUSE RESPIRATORY AND NASAL IRRITATION. SEE SECTIONS 7 AND 11 REGARDING THE TOXICITY AND POSSIBLE FORMATION/ACCUMULATION OF HYDROGEN SULFIDE GAS.

INGESTION:

MAY BE TOXIC BY INGESTION. ASPIRATION (INADVERTENT SUCTION) OF LIQUID OF THE LIGHT HYDROCARBON FRACTION INTO THE LUNG CAN PRODUCE CHEMICAL PNEUMONITIS, PULMONARY EDEMA/HEMORRHAGE AND EVEN DEATH.

CARCINOGEN LISTING:

THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE FOR THE CARCINOGENICITY OF CRUDE OIL IN HUMANS. LIFETIME SKIN PAINTING STUDIES WITH DIFFERENT WHOLE CRUDE OILS HAVE PRODUCED TUMORS IN ANIMALS FOLLOWING PROLONGED AND REPEATED SKIN CONTACT. IARC HAS DETERMINED THAT THERE IS LIMITED EVIDENCE FOR THE CARCINOGENICITY OF CRUDE OIL IN ANIMALS.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

PREEXISTING SKIN, EYE AND RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO COMPONENTS OF THIS PRODUCT.

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4. FIRST AID MEASURES

EYE:

FLUSH EYES WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

SKIN:

WASH WITH SOAP AND LARGE AMOUNTS OF WATER. REMOVE CONTAMINATED CLOTHING. IF SYMPTOMS OF IRRITATION OCCUR, CALL A PHYSICIAN.

INHALATION:

IF AFFECTED, MOVE PERSON TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF NOT BREATHING OR IF NO HEARTBEAT, GIVE ARTIFICIAL RESPIRATION OR CARDIOPULMONARY RESUSCITATION (CPR). IMMEDIATELY CALL A PHYSICIAN. IF SYMPTOMS OF IRRITATION OCCUR WITH ANY EXPOSURE, CALL A PHYSICIAN.

INGESTION:

INGESTION NOT LIKELY. IF SWALLOWED, DO NOT INDUCE VOMITING AND DO NOT GIVE LIQUIDS. IMMEDIATELY CALL A PHYSICIAN.

NOTES TO PHYSICIAN:

NO DATA AVAILABLE.

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5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	20-100 F
AUTOIGNITION TEMP:	NO DATA AVAILABLE
EXPLOSIVE LIMITS (% BY VOLUME IN AIR)	
LOWER:	NO DATA AVAILABLE
UPPER:	NO DATA AVAILABLE

FIRE AND EXPLOSION HAZARDS:

THIS MATERIAL HAS BEEN DETERMINED TO BE A FLAMMABLE LIQUID. VAPORS MAY TRAVEL ALONG THE GROUND OR BE MOVED BY VENTILATION AND IGNITED BY MANY SOURCES SUCH AS PILOT LIGHTS, SPARKS, ELECTRIC MOTORS, STATIC DISCHARGE, OR OTHER IGNITION SOURCES AT LOCATIONS DISTANT FROM MATERIAL HANDLING. FLASHBACK MAY OCCUR ALONG VAPOR TRAIL. FOR ADDITIONAL FIRE RELATED INFORMATION, SEE NFPA 30 OR NORTH AMERICAN EMERGENCY RESPONSE GUIDE 115.

EXTINGUISHING MEDIA:

CLASS B FIRE EXTINGUISHING MEDIA SUCH AS CO2, DRY CHEMICAL OR WATER SPRAY CAN BE USED. FIRE FIGHTING SHOULD BE ATTEMPTED ONLY BY THOSE WHO ARE ADEQUATELY TRAINED AND EQUIPPED WITH PROPER PROTECTIVE EQUIPMENT.

SPECIAL FIRE FIGHTING INSTRUCTIONS:

AVOID USING STRAIGHT WATER STREAMS. WATER SPRAY AND FOAM (AFFF/ATC) MUST BE APPLIED CAREFULLY TO AVOID FROTHING. AVOID EXCESSIVE APPLICATION. WATER CAN BE USED TO COOL EXPOSED SURFACES FROM AS FAR A DISTANCE AS POSSIBLE. KEEP RUN-OFF WATER OUT OF SEWERS AND WATER SOURCES.

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6. ACCIDENTAL RELEASE MEASURES

ISOLATE AND EVACUATE AREA. SHUT OFF SOURCE IF SAFE TO DO SO. ADVISE

NATIONAL RESPONSE CENTER (800-424-8802) IF SUBSTANCE HAS ENTERED A WATERWAY. NOTIFY LOCAL HEALTH AND POLLUTION CONTROL AGENCIES, IF APPROPRIATE. CONTAIN LIQUID WITH SAND OR SOIL. RECOVER AND RETURN FREE LIQUID TO PROPER CONTAINERS. USE SUITABLE ABSORBENT MATERIALS SUCH AS VERMICULITE, SAND, OR CLAY TO CLEAN UP RESIDUAL LIQUIDS.

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7. HANDLING AND STORAGE

COMPLY WITH ALL APPLICABLE OSHA, NFPA AND CONSISTENT LOCAL REQUIREMENTS. USE APPROPRIATE GROUNDING AND BONDING PRACTICES. STORE IN PROPERLY CLOSED CONTAINERS THAT ARE APPROPRIATELY LABELED AND IN A COOL, WELL-VENTILATED AREA. DO NOT EXPOSE TO HEAT, OPEN FLAME, OXIDIZERS OR OTHER SOURCES OF IGNITION. DO NOT CUT, DRILL, GRIND OR WELD ON EMPTY CONTAINERS SINCE THEY MAY CONTAIN EXPLOSIVE RESIDUES.

HARMFUL CONCENTRATIONS OF HYDROGEN SULFIDE (H2S) GAS CAN ACCUMULATE IN EXCAVATIONS AND LOW-LYING AREAS AS WELL AS THE VAPOR SPACE OF STORAGE AND BULK TRANSPORT COMPARTMENTS. STAY UPWIND AND VENT OPEN HATCHES BEFORE UNLOADING. AVOID SKIN CONTACT. EXERCISE GOOD PERSONAL HYGIENE INCLUDING REMOVAL OF SOILED CLOTHING AND PROMPT WASHING WITH SOAP AND WATER.

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8. EXPOSURE CONTROL / PERSONAL PROTECTION

ENGINEERING CONTROLS:

LOCAL OR GENERAL EXHAUST REQUIRED IN ENCLOSED AREAS OR WITH INADEQUATE VENTILATION.

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION:

NOT NORMALLY REQUIRED FOR ROUTINE OPERATIONS. SUPPLIED AIR RESPIRATORS SHOULD BE USED IF OPERATING CONDITIONS CREATE AIRBORNE CONCENTRATIONS WHICH EXCEED EXPOSURE LIMITS FOR ANY INDIVIDUAL COMPONENTS (INCLUDING H2S). OBSERVE RESPIRATOR PROTECTION FACTOR CRITERIA CITED IN ANSI Z88.2. SELF-CONTAINED BREATHING APPARATUS SHOULD BE USED FOR FIRE FIGHTING.

SKIN PROTECTION:

NEOPRENE OR NITRILE GLOVES TO PREVENT SKIN CONTACT.

EYE PROTECTION:

NO SPECIAL EYE PROTECTION IS NORMALLY REQUIRED. WHERE SPLASHING IS

POSSIBLE, WEAR SAFETY GLASSES WITH SIDE SHIELDS.

OTHER PROTECTIVE EQUIPMENT:

USE EXPLOSION-PROOF EQUIMENT.

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9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT:	100-1000 F
MELTING POINT:	NO DATA AVAILABLE
SPECIFIC GRAVITY (H20=1):	0.8-1.0
PACKING DENSITY (KG/M3):	NO DATA AVAILABLE
% SOLUBILITY IN WATER:	NEGLIGIBLE
VAPOR DENSITY (AIR=1):	NO DATA AVAILABLE
VAPOR PRESSURE:	0-724 MMHG
PH INFORMATION:	NO DATA AVAILABLE
% VOLATILES BY VOL:	NO DATA AVAILABLE
EVAPORATION RATE:	NO DATA AVAILABLE
APPEARANCE:	AMBER TO BLACK VISCOUS LIQUID
ODOR:	MILD OR ROTTEN EGG ODOR
ODOR THRESHOLD (PPM):	NO DATA AVAILABLE

ADDITIONAL PROPERTIES:

DENSITY: 6.6-8.2 LBS/GALLON

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10. STABILITY AND REACTIVITY

STABILITY:

THE MATERIAL IS STABLE AT 70 F, 760MM PRESSURE.

CONDITIONS TO AVOID:

EXCESSIVE HEAT, SOURCES OF IGNITION.

HAZARDOUS DECOMPOSITION PRODUCTS:

CARBON MONOXIDE, HYDROGEN SULFIDE, ALDEHYDES, AROMATIC, OTHER HYDROCARBONS.

INCOMPATIBLE MATERIALS:

STRONG OXIDIZING AGENTS SUCH AS CHLORATES, NITRATES, PEROXIDES.

HAZARDOUS POLYMERIZATION:

WILL NOT OCCUR.

CONDITIONS TO AVOID:

NO DATA AVAILABLE.

ADDITIONAL COMMENTS:

NO DATA AVAILABLE.

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11. TOXICOLOGICAL INFORMATION

LIFETIME SKIN PAINTING STUDIES IN ANIMALS WITH CRUDE OIL FRACTIONS HAVE PRODUCED WEAK TO MODERATE CARCINOGENIC ACTIVITY FOLLOWING PROLONGED AND REPEATED EXPOSURE. WASHING THE ANIMALS' SKIN WITH SOAP AND WATER BETWEEN APPLICATIONS GREATLY REDUCES TUMOR FORMATION.

REPEATED DERMAL APPLICATION OF TWO DIFFERENT CRUDE OILS IN RATS PRODUCED SYSTEMIC TOXICITY IN BLOOD, LIVER, THYMUS AND BONE MARROW. REPEATED DERMAL APPLICATION TO PREGNANT RATS PRODUCED MATERNAL TOXICITY AND FETAL DEVELOPMENTAL TOXICITY.

HYDROGEN SULFIDE CONCENTRATIONS WILL VARY SIGNIFICANTLY DEPENDING ON THE SOURCE AND SULFUR CONTENT OF THE CRUDE. SWEET CRUDES (<0.5% SULFUR) MAY CONTAIN TOXICOLOGICALLY SIGNIFICANT LEVELS OF HYDROGEN SULFIDE IN THE VAPOR SPACES OF BULK STORAGE TANKS AND TRANSPORT COMPARTMENTS. CONCENTRATIONS OF H2S AS LOW AS 10 PPM OVER AN 8 HOUR WORKSHIFT MAY CAUSE EYE OR THROAT IRRITATION. PROLONGED BREATHING OF 50-100 PPM H2S VAPORS CAN PRODUCE SIGNIFICANT EYE AND RESPIRATORY IRRITATION. SOUR CRUDES COMMONLY CONTAIN EXTREMELY HIGH CONCENTRATIONS OF H2S (500-70,000 PPM) IN THE VAPOR SPACES OF BULK STORAGE VESSELS. EXPOSURE TO 250-600 PPM FOR 15-30 MINUTES CAN PRODUCE HEADACHE, DIZZINESS, NERVOUSNESS, STAGGERING GAIT, NAUSEA AND PULMONARY EDEMA OR BRONCHIAL PNEUMONIA. CONCENTRATIONS >1,000 PPM WILL CAUSE IMEMDIATE UNCONSCIOUSNESS AND DEATH THROUGH RESPIRATORY PARALYSIS.

SUMMARY OF HEALTH EFFECT DATA ON CRUDE OIL COMPONENTS:

THIS PRODUCT MAY CONTAIN BENZENE AT A LEVEL OF >0.1%. REPEATED OR PROLONGED EXPOSURE TO BENZENE AT CONCENTRATIONS IN EXCESS OF THE TLV MAY CAUSE SERIOUS INJURY TO BLOOD-FORMING ORGANS. SIGNIFICANT CHRONIC EXPOSURE TO BENZENE VAPOR HAS BEEN REPORTED TO PRODUCE VARIOUS BLOOD DISORDERS, RANGING FROM ANEMIA TO CANCER (DIFFERENT FORMS OF LEUKEMIA) IN MAN. BENZENE PRODUCED TUMORS IN RATS AND MICE IN LIFETIME CHRONIC TOXICITY STUDIES, BUT THE RESPONSE HAS NOT BEEN CONSISTENT ACROSS SPECIES, STRAIN, SEX OR ROUTE OF EXPOSURE. ANIMAL STUDIES ON BENZENE HAVE DEMONSTRATED IMMUNE TOXICITY, CHROMOSOMAL ABERRATIONS, TESTICULAR EFFECTS AND ALTERATIONS IN REPRODUCTIVE CYCLES AND EMBRYO/FETOTOXICITY, BUT NOT TERATOGENICITY.

THIS PRODUCT MAY CONTAIN HEXANE AT A LEVEL OF >1.0%. STUDIES IN LABORATORY ANIMALS HAVE PRODUCED SYSTEMIC TOXICITY IN BLOOD, SPLEEN AND LUNGS. FETOTOXICITY HAS BEEN OBSERVED AT HEXANE CONCENTRATIONS THAT PRODUCED

MATERNAL TOXICITY. LONG TERM EXPOSURE TO HIGH CONCENTRATIONS OF HEXANE HAS BEEN SHOWN TO CAUSE TESTICULAR EFFECTS AND NERVOUS SYSTEM DAMAGE.

THIS PRODUCT MAY CONTAIN TOLUENE AT A LEVEL OF >1.0%. DELIBERATE INHALATION OF HIGH CONCENTRATIONS OF TOLUENE HAS BEEN SHOWN TO CAUSE LIVER, KIDNEY AND BRAIN DAMAGE AND CENTRAL NERVOUS SYSTEM EFFECTS. EXCESSIVE TOLUENE EXPOSURE MAY CAUSE CARDIAC SENSITIZATION AND POSSIBLE HEARING LOSS. EXPOSURE TO PREGNANT RATS AND MICE DURING GESTATION TO TOLUENE PRODUCED SOME MATERNAL AND DEVELOPMENTAL TOXICITY. DECREASED LEARNING CAPABILITY AND DEFICITS IN OPERANT BEHAVIOR HAVE BEEN OBSERVED IN ANIMALS EXPOSED TO TOLUENE ABOVE THE TLV.

THIS PRODUCT MAY CONTAIN XYLENE AT A LEVEL OF >1.0%. GROSS OVEREXPOSURE IN HUMANS TO XYLENES HAS BEEN REPORTED TO CAUSE LUNG, LIVER, KIDNEY, HEART AND BRAIN DAMAGE AS WELL AS NEUROLOGIC DISTURBANCES. EXCESSIVE XYLENE EXPOSURE MAY CAUSE CARDIAC SENSITIZATION. LABORATORY ANIMALS EXPOSED TO HIGH DOSES OF XYLENE SHOWED EVIDENCE OF HEARING LOSS AND EFFECTS IN LIVER, KIDNEYS, LUNGS, SPLEEN, HEART AND ADRENALS. EXPOSURE TO PREGNANT ANIMALS DURING GESTATION TO SIGNIFICANT CONCENTRATIONS OF XYLENE PRODUCED MATERNAL, FETAL AND DEVELOPMENTAL TOXICITY. REPEATED INHALATION OF HIGH XYLENE CONCENTRATIONS HAVE SHOWN BEHAVIORAL CHANGES IN ANIMALS AND MAN.

COMPONENTS OF CRUDE OIL DO NOT PRESENT A SIGNIFICANT HEALTH RISK IN THE CONCENTRATIONS PRESENT IN CRUDE OIL AT EXPOSURES NOT EXCEEDING THE EXPOSURE LIMITS STATED IN SECTION 2.

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12. ECOLOGICAL INFORMATION

COATING ACTION OF OIL CAN DESTROY BIRDS, PLANKTON, ALGAE AND FISHES. KEEP OUT OF ALL BODIES OF WATER AND SEWAGE DRAINAGE SYSTEMS.

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13. DISPOSAL CONSIDERATIONS

THIS PRODUCT AS SUPPLIED IS NOT SPECIFICALLY LISTED AS AN EPA RCRA HAZARDOUS WASTE ACCORDING TO FEDERAL REGULATIONS (40 CFR 261-271). HOWEVER, WHEN DISCARDED OR DISPOSED OF, IT MAY MEET THE CRITERIA OF AN "IGNITABLE" HAZARDOUS WASTE. THIS PRODUCT COULD ALSO CONTAIN BENZENE AT >0.5 PPM AND COULD EXHIBIT THE CHARACTERISTICS OF "TOXICITY" AS DETERMINED BY THE TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). THIS MATERIAL COULD ALSO BECOME A HAZARDOUS WASTE IF MIXED OR CONTAMINATED WITH A LISTED HAZARDOUS WASTE. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE IF DISPOSAL MATERIAL IS HAZARDOUS ACCORDING TO FEDERAL, STATE AND LOCAL REGULATIONS.

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14. TRANSPORTATION INFORMATION

49 CFR 172.101:

PROPER SHIPPING NAME:	PETROLEUM CRUDE OIL
DOT CLASSIFICATION:	3
DOT IDENTIFICATION NUMBER:	UN 1267
PACKING GROUP:	PG II

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15. REGULATORY INFORMATION

THE FOLLOWING REGULATIONS APPLY TO THIS PRODUCT:

OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200):

THIS PRODUCT HAS BEEN EVALUATED AND DETERMINED TO BE HAZARDOUS AS DEFINED IN OSHA'S HAZARD COMMUNICATION STANDARD.

EPA TOXIC SUBSTANCES CONTROL ACT (40 CFR PART 710):

THIS PRODUCT AND/OR ITS COMPONENTS ARE LISTED ON THE TSCA CHEMICAL INVENTORY.

EPA SARA TITLE III SUPERFUND AMENDMENTS & REAUTHORIZATION ACT - EMERGENCY PLANNING & COMMUNITY RIGHT-TO-KNOW ACT OF 1986.

EXTREMELY HAZARDOUS SUBSTANCES (40 CFR PART 355):

THIS PRODUCT CONTAINS THE FOLLOWING COMPONENT(S) IDENTIFIED ON APPENDIX A AND B OF THE EXTREMELY HAZARDOUS SUBSTANCE LIST (AT A LEVEL OF 1% OR GREATER IF HAZARDOUS; 0.1% OR GREATER IF CARCINOGENIC):

---COMPONENT---	REPORTABLE ---QUANTITY (LBS)---	THRESHOLD PLANNING ---QUANTITY (LBS)---
HYDROGEN SULFIDE	100	500

EMERGENCY RELEASE NOTIFICATIONS (40 CFR PART 355):

THIS PRODUCT CONTAINS THE FOLLOWING COMPONENT(S) IDENTIFIED EITHER AS AN EXTREMELY HAZARDOUS SUBSTANCE (40 CFR 355) OR A CERCLA HAZARDOUS SUBSTANCE (40 CFR 302) WHICH IN CASE OF A SPILL OR RELEASE MAY BE SUBJECT TO EMERGENCY RELEASE REPORTING REQUIREMENTS:

HYDROGEN SULFIDE (REPORTING QUANTITY = 100 LBS)

MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR PART 370):

THE FOLLOWING EPA HAZARD CATEGORIES APPLY TO THIS PRODUCT:

IMMEDIATE (ACUTE) HEALTH HAZARD
DELAYED (CHRONIC) HEALTH HAZARD
FIRE HAZARD

MSDS'S OR A LIST OF MSDS'S AND THEIR HAZARDS (SEE EPA HAZARD CATEGORIES ABOVE) MAY BE REQUIRED TO BE SUBMITTED TO THE STATE EMERGENCY RESPONSE COMMISSION (SERC), LOCAL EMERGENCY PLANNING COMMITTEE (LEPC) AND LOCAL FIRE DEPARTMENT (LFD.

IN ADDITION, A TIER II OR TIER I FORM MAY BE REQUIRED TO BE SUBMITTED ANNUALLY TO THE SERC, LEPC AND LFD IF APPLICABLE THRESHOLD REPORTING QUANTITIES ARE EXCEEDED. CURRENT FEDERAL THRESHOLDS ARE:

10,000 POUNDS OR MORE OF AN OSHA HAZARDOUS SUBSTANCE
OR
500 POUNDS OR THE THRESHOLD PLANNING QUANTITY, WHICHEVER IS LESS, OF AN EXTREMELY HAZARDOUS SUBSTANCE.

NOTE: THRESHOLDS MAY VARY ACCORDING TO LOCAL AND STATE REGULATIONS.

TOXIC CHEMICAL RELEASE REPORTING (40 CFR PART 372):

THIS PRODUCT CONTAINS THE FOLLOWING COMPONENT(S) (AT A LEVEL OF 1% OR GREATER IF HAZARDOUS; 0.1% OR GREATER IF CARCINOGENIC) THAT MAY BE SUBJECT TO REPORTING ON THE TOXIC RELEASE INVENTORY (TRI) FORM R:

---COMPONENT---	---CAS NUMBER---
BENZENE	71-43-2
TOLUENE	108-88-3
XYLENE	1330-20-7
HEXANE	110-54-3

STATE AND COMMUNITY RIGHT-TO-KNOW REGULATIONS:

THIS MATERIAL MAY BE REGULATED BY LOUISIANA'S RIGHT-TO-KNOW LAW (REGULATORY STATUTE 30:2361).

Return to top Return to Crude Safety Data List Return to full Chemical Safety Data List

16. OTHER INFORMATION

NFPA CLASSIFICATION		HMIS CLASSIFICATION		HAZARD RATING
HEALTH:	1	HEALTH:	1	0 - LEAST
FIRE:	3	FIRE:	3	1 - SLIGHT
REACTIVITY:	0	REACTIVITY:	0	2 - MODERATE
OTHER:	-	PERSONAL PROTECTION:	*	3 - HIGH
				4 - EXTREME

COMMENTS:

* SEE SECTION 8 FOR GUIDANCE IN SELECTION OF PERSONAL PROTECTIVE EQUIPMENT.

Return to top Return to Crude Safety Data List Return to full Chemical Safety Data List

Updated: Friday, June 29, 2001

APPENDIX C

CERTIFICATION OF HAZARDOUS WASTE TRAINING, MEDICAL SURVEILLANCE, AND FIT TESTING

CONCENTRA MEDICAL CENTERS
OAK RIDGE, TENNESSEE 37830
MEDICAL SURVEILLANCE CERTIFICATE

Beatwright, Jarette D. 409-510035

Has completed a physical exam in accordance with:

(X)	29CFR 1910.120	HazWaste
( )	29CFR 1910.1001/1926.1101	Asbestos
(X)	29CFR 1910.134	Respiratory Protection
(X)	ANSI Z117.1-1995	Sec. 16 Confined Spaces

And is MEDICALLY QUALIFIED. Restrictions on reverse.

Issue date 1-24-03 Exam Due 1-24-04

Provider: [signature] PA-C

PERMIT-REQUIRED CONFINED SPACE
WORKER TRAINING COURSE

NAME: JARETTE D BOATWRIGHT

S.S.#: 409-51-0035

CERTIFICATION #: 40951003551510202

DATE COMPLETED: 2/1/02 | TRAINER INITIALS: MK

THIS CERTIFICATE INDICATES SUCCESSFUL COMPLETION OF TRAINING AS REQUIRED BY OSHA 29CFR 1910.146

LABORERS-AGC
EDUCATION AND TRAINING FUND

37 Deerfield Road
P.O. Box 37
Pomfret Center, CT 06259
(860) 974-0800

Certificate of Completion

Jarette Boatwright

In Recognition of Having Successfully Completed

HAZWOPER 8 HOUR ANNUAL REFRESHER

on

January 30, 2003

in accordance with

OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-03- 1423

Certificate of Completion

Jarette Boatwright

In Recognition of Having Successfully Completed

HAZWOPER 8 HOUR ANNUAL REFRESHER

on

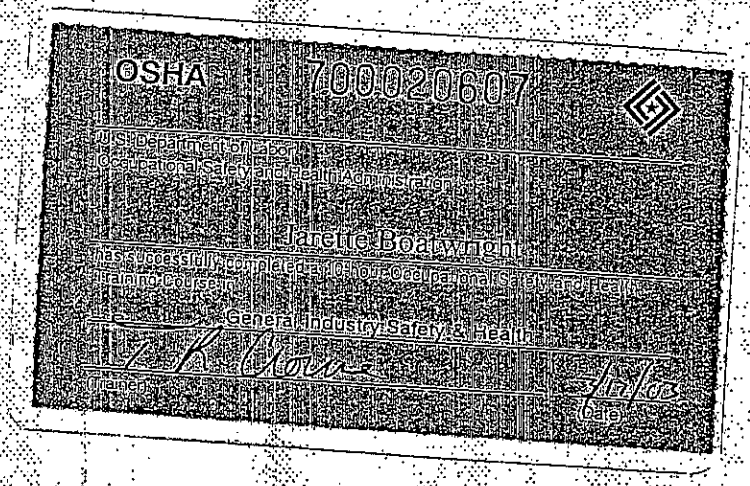
January 30, 2003

in accordance with

OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-03- 1423


OSHA
70020607
U.S. Department of Labor
Occupational Safety and Health Administration
Janette Boatwright
has successfully completed a 10-hour Outreach
training course in
General Industry Safety & Health
Date

CONCENTRA MEDICAL CENTERS
1030 OAK RIDGE TURNPIKE
OAK RIDGE, TENNESSEE 37830
(865)425-4640

PHYSICIAN'S STATEMENT

Brewer II, William E.

DATE OF EXAM: 2-3-03

Employer: Step Inc
SSN: 414-47-1566 DOB: 06/12/1969
Case Date: 02/03/2003

TYPE OF EXAM: ☐ BASELINE ☒ ANNUAL ☐ EXIT

OPINION OF RISK/MEDICAL CLEARANCE FOR HAZARDOUS WASTE OPERATIONS

I have reviewed the results of the occupational and medical history, physical examination and laboratory tests and based upon these, I certify that this individual:

[X] has no medical condition that would place the individual at increased risk of health impairment from hazardous waste site work, when conducted under the conditions of adequate training and a health and safety plan.

[ ] has a medical condition that would place the individual at increased risk of health impairment from hazardous waste site work.

[ ] has a medical condition which may require special consideration by the company.

[ ] deferred, pending further evaluation.

MEDICAL CLEARANCE FOR RESPIRATOR USE

Based upon the examination, I certify that this individual:

[X] is medically qualified to use properly fitted respiratory protection equipment.

[ ] is NOT medically qualified to use respiratory protection equipment.

[X] qualified for Confined Space Entry.

[ ] is NOT qualified for Confined Space Entry.

[ ] deferred, pending further evaluation.

Comments/Restrictions
[ ] The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.1001, 1926.1101, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.

[X] The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.

[X] Corrective lenses required Near

[X] Deficient stereo depth perception.

[X] Hearing protection recommended

[X] Recommend tetanus toxoid immunization be updated. Every 10 yrs.

EMPLOYEE NOTIFICATION
This individual has been informed of the results of this medical examination. Detected medical conditions which require additional examinations or treatment have been explained and applicable follow-up recommended.

Signature Of Provider: Don E Cope PA-C Date: 2-5-03

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME (Last, First, Middle Initial) BREWSER, WILLAIM E.

S.S. # 414-47-1566

HAS RECEIVED BASIC INSTRUCTION ON PROPER RESPIRATOR USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 02-03-03 EXP. DATE 02-03-04

TECHNICIAN SIGNATURE Jerie Stewart

RESPIRATOR INFORMATION

MODEL	TYPE	SIZE	App #	PT
MSA ADVANTAGE 100	HALF	L	21C-600	10

VALID WITH CURRENT MEDICAL CLEARANCE

Date Completed:

11/02/2001

Receipt #

93088

International Union of Operating Engineers
Hazmat Training Program

Local DOE

This is to certify that

William E. Brewer II

has successfully completed the 40-hour Hazardous Waste Training Program specifically designed for workers in accordance with OSHA at 29 CFR 1910.120.

Certified Instructor

Certification of Completion

Presented to

STEP Inc.

Billy Brewer

of

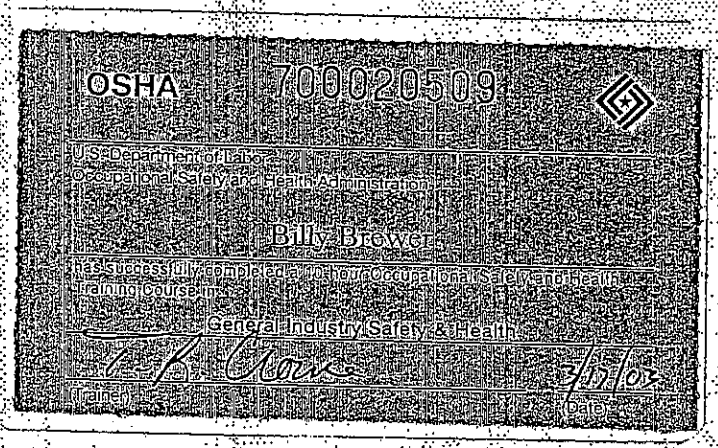
STEP, Inc.

In Recognition of Having Successfully Completed the
40-Hour Training for
Hazardous Waste Operations and Emergency Response
in accordance with
OSHA 29 CFR 1910.120

T. R. Crouse

T.R. Crouse

November 20, 1998


OSHA
700020509
U.S. Department of Labor
Occupational Safety and Health Administration
Billy Brower
has successfully completed a 10-hour Occupational Safety and Health
training course in
General Industry Safety & Health
Trainer
Date

American Red Cross
We'll be there.

This recognizes that

BILLY BREWER

has completed the requirements for

Adult CPR

conducted by

Appalachian Chapter

Date completed 11-9-2001

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.

American Red Cross
We'll be there.

This recognizes that

BILLY BREWER

has completed the requirements for

First Aid Basics

conducted by

Appalachian Chapter

Date completed 11-9-2001

The American Red Cross recognizes this certificate as valid for 3 year(s) from completion date.

Temporary Certificate of Completion

WILLIAM EDWARD BREWER, II

completed the requirements of

Kelly's HAZWOPER 8 Hour Annual Refresher Online

on 2/7/2003.

Kelly Scientific Resources, Inc. will mail the final Certificate of Completion within 60 calendar days of the completion date.
This Temporary Certificate VOID 60 days after completion date.
If you need the final certificate sooner, please call our Hot Line at **865-777-1401 ext.201**

Thank you for choosing Kelly for your training needs. We look forward to serving you again soon.

CONCENTRA MEDICAL CENTERS
1030 OAK RIDGE TURNPIKE
OAK RIDGE, TENNESSEE 37830
(865)425-4640

PHYSICIAN'S STATEMENT

Hawn, George D.

Employer: Step Inc
SSN: 413-17-6022 DOB: 06/08/1960
Case Date: 04/03/2003

DATE OF EXAM: 4-3-03

TYPE OF EXAM: ☐ BASELINE ☒ ANNUAL ☐ EXIT

OPINION OF RISK/MEDICAL CLEARANCE FOR HAZARDOUS WASTE OPERATIONS

I have reviewed the results of the occupational and medical history, physical examination and laboratory tests and based upon these, I certify that this individual:

[X] has no medical condition that would place the individual at increased risk of health impairment from hazardous waste site work, when conducted under the conditions of adequate training and a health and safety plan.

[ ] has a medical condition that would place the individual at increased risk of health impairment from hazardous waste site work.

[ ] has a medical condition which may require special consideration by the company.

[ ] deferred, pending further evaluation.

MEDICAL CLEARANCE FOR RESPIRATOR USE

Based upon the examination, I certify that this individual:

[X] is medically qualified to use properly fitted respiratory protection equipment.

[ ] is NOT medically qualified to use respiratory protection equipment.

[X] qualified for Confined Space Entry.

[ ] is NOT qualified for Confined Space Entry.

[ ] deferred, pending further evaluation.

Comments/Restrictions

[ ] The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.1001, 1926.1101, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.

[X] The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.

[ ] Corrective lenses required [ ] Deficient stereo depth perception.

[X] Hearing protection recommended [X] Recommend tetanus toxoid immunization be updated. Every 10 yrs.

EMPLOYEE NOTIFICATION

This individual has been informed of the results of this medical examination. Detected medical conditions which require additional examinations or treatment have been explained and applicable follow-up recommended.

Signature Of Provider: Don E Cope PA-C Date: 4-8-03

Timothy R. Dodd MD

American Red Cross
We'll be there.

This recognizes that

DOUG HAWN

has completed the requirements for

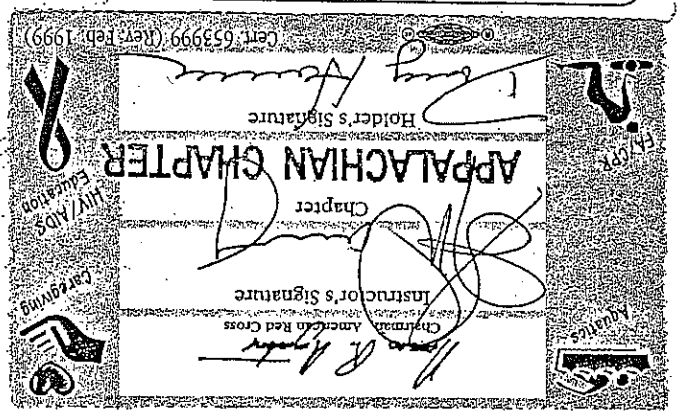
First Aid Basics

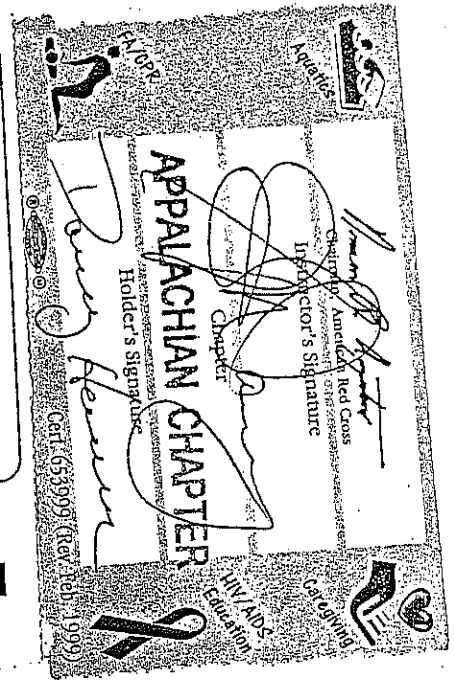
conducted by

Appalachian Chapter

Date completed 10/3/2002

The American Red Cross recognizes this certificate as valid for 3 year(s) from completion date.





This recognizes that

Doug Hawn

has completed the requirements for

Adult CPR

conducted by

Appalachian Chapter

Date completed 10/3/2002

The American Red Cross recognizes this certificate as valid for year(s) from completion date.

American Red Cross
We'll be there.

Certificate of Completion

Presented to

Doug Hawn

of

STEP, Inc.

For Successful Completion of

Emergency Action/Fire Prevention; UST Removal

T. R. Crouse

T.R. Crouse, M.S. **February 10, 2003**

Temporary Certificate of Completion

George Douglas Hawn

completed the requirements of

Kelly's HAZWOPER 8 Hour Annual Refresher Online

on 8/11/2003.

Kelly Scientific Resources, Inc. will mail the final Certificate of Completion within 60 calendar days of the completion date.
This Temporary Certificate VOID 60 days after completion date.
If you need the final certificate sooner, please call our Hot Line at 865-777-1401 ext.201

Thank you for choosing Kelly for your training needs. We look forward to serving you again soon.

CONCENTRA MEDICAL CENTERS
1030 OAK RIDGE TURNPIKE
OAK RIDGE, TN 37830
(865) 425-4640
FAX: (865) 425-4646

TEMPORARY MEDICAL CERTIFICATION

(THIS CERTIFICATION EXPIRES 30 DAYS FROM DATE OF EXAMINATION)

McKamey, Terry

Employer: Step Inc
SSN: 410-06-8572 DOB: 02/13/1963
Case Date: 03/07/2003

A physical examination has been completed in accordance with the requirements of OSHA Standard(s):

- ☑ 29CFR1910.120 (Hazardous Waste)
- ☑ 1910.134 (Respiratory Protection)
- ☐ 1910.1001/1926.1101 (Asbestos)

on the above named individual on 3-07-03.

Based upon the findings from the physical examination and spirometry test, I have determined this individual may / may not use respiratory protection while performing his or her employment services.

Upon receipt and review of all test results, including laboratory test, a final report (Physician's Statement) on the above named individual will be forwarded to you, the employer.

* Mandatory use of hearing protection

use nonporous ear plug to left ear with respirator; or
Full hood positive pressure respirator.

EMPLOYEE NOTIFICATION

The above named individual will be informed of the results of this medical examination. Detected medical conditions, which require additional examinations or treatment, will be explained and applicable follow-up recommended.

RECORD OF THE ABOVE MAINTAINED AT CONCENTRA MEDICAL CENTERS

Signature of Provider Timothy R. Oesch, M.D. Date 3-11-03

RESPIRTATION INFORMATION

MODEL	TYPE	SIZE	App#	PT
MSA ULTRA-TWIN	FULL	M	TC-84A-0181	100

VALID WITH CURRENT MEDICAL CLEARANCE

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME *(Last, First, Middle Initial)* McKamey, Terry

S.S.# 410-06-8572

HAS RECEIVED BASIC INSTRUCTION ON PROPER USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 3/7/03 EXP. DATE 3/7/04

TECHNICIAN SIGNATURE

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME *(Last, First, Middle Initial)* McKamey, Terry

S.S.# 410-06-8572

HAS RECEIVED BASIC INSTRUCTION ON PROPER USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 3/7/03

EXP. DATE 3/7/04

TECHNICIAN SIGNATURE

Association of
Bay Area Governments

ABAG Training Center
www.hazmatschool.com

CERTIFICATE OF COMPLETION

Terry McKamey

has successfully completed the course titled

OSHA 8-hr Annual HAZWOPER Refresher

on

June 28, 2002

and has earned

0.8 CEUs (Continuing Education Units) from the program

Certificate No. 30036
(verify at www.hazmatschool.com)

Terry Bursztynsky, Training Director
Sharon Kendrick, Training Coordinator
www.abag.ca.gov; (510) 464-7964

Paul W. Gantt, REA
Safety Compliance Management, Inc.

ERC
Environmental
and Energy
Services Co.

Certify that

Terry W. McKamey

of

ERCE

Successfully Completed a
40 Hour OSHA Training Certification
in

HAZARDOUS WASTE OPERATIONS

29 CFR 1910.120
and is awarded this Certificate

Michael D. Kelly CSP, CIH, CHMM
Instructor

July 9-13, 1990
Date

90A-0140

ERCE

Certify that

Terry W. McKamey

of

ERCE

Successfully Completed a Training Certification
in

CONFINED SPACE ENTRY - MMES MODULES 1549, 1550, and 1551

29 CFR 1910.146

ANSI Z117.1-1977 and Z1171.1-1989

and is awarded this certificate

Michael D. Palmer

Michael D. Palmer CSP, CIH, CHMM

9/26/90

Date

MK-FERGUSON OF OAK RIDGE
TRAINING DEPARTMENT
QUALIFICATION & IDENTIFICATION

NAME Jerry McKamey

SOCIAL SECURITY # 410-06-8572 BADGE # 611579

It is certified that the employee listed above has been trained in the following:

SUBJECT	TRN DATE	EXPIRATION DATE
LOCKOUT TAGOUT (S-17) (MOD#221)	2-1093	NA
LOCKOUT TAGOUT MK-F (#3A-2.11)	2-10-93	NA
RCRA SUPERVISOR		
RCRA 90 DAY ACCUMULATION AREA-EMERGENCY RESPONSE		

Verified by: A.D.

For verification contact the MK-F Training Dept. at 576-3595

MK-FERGUSON OF OAK RIDGE COMPANY
A MORRISON KNUDSEN COMPANY

GENERAL EMPLOYEE TRAINING
GET

Name: Terry McKamey

Company: Step

SSN: Badge Number: 611579

Training Date: 7.10.98

Expiration Date: 7.10.00

611579
Card No./Employee ID No.

UNITED STATES
DEPARTMENT OF ENERGY
OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

CERTIFICATE OF CORE RADIOLOGICAL TRAINING

Radiological Worker II
(Course Title)

Terry McKamey
(Employee Name)

has successfully completed the above standarized core training course and shall be granted acess to DOE sites subject to the limitations stated on the back of this card.

3-26-97
Date of Training

Training Representative

3-26-99
Expiration Date

Jacobs Engineering Group
Site/Location Training Provided

S/CSE-504-003

STEP

Oak Ridge, Tennessee

certifies that

Terry W. McKamey

STEP, Inc.

HAS SUCCESSFULLY COMPLETED THE CONFINED [illegible]
TRAINING FOR ATTENDANT/ENTRANT/SUPERVI[illegible]
AS REQUIRED BY OSHA 29 CFR 1910.146

Michael D. Palmer

Michael D. Palmer, CIH, CSP, CHMM

May 7, 1994

611579
Card No./Employee ID No.

UNITED STATES
DEPARTMENT OF ENERGY
OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

CERTIFICATE OF CORE RADIOLOGICAL TRAINING

Radiological Control Technician
(Course Title)

Terry McKamey
(Employee Name)

has successfully completed the above standarized core training course and shall be granted acess to DOE sites subject to the limitations stated on the back of this card.

3-25-97
Date of Training

Training Representative

3-25-99
Expiration Date

Jacobs Engineering Group
Site/Location Training Provided

Certification of Completion

Presented to

Terry McKamey

of

Solutions To Environmental Problems, Inc.

In Recognition of Having Successfully Completed the Bloodborne Pathogen Awareness Training in accordance with OSHA 29 CFR 1910.1030

Michael D. Palmer 12/5/96.

Michael D. Palmer, CSP, CIH. CHMM

Certification of Completion

SHR-0596-003

Presented to

Terry W. McKamey

of

STEP, Inc.

In Recognition of Having Successfully Completed
"Hoisting & Rigging Inspection" Training

Michael D. Palmer, CSP, CIH, CHMM

6/11/96
Date


OSHA
700020590
U.S. Department of Labor
Occupational Safety and Health Administration
Terry McKamey
has successfully completed a 10-hour Occupational Safety and Health
training course in
General Industry Safety & Health
Trainer
Date

CONCENTRA MEDICAL CENTERS
OAK RIDGE, TENNESSEE 37830
MEDICAL SURVEILLANCE CERTIFICATE

Madaj, Ambrose S. 440-62-9608

Has completed a physical exam in accordance with:

(X)	29CFR 1910.120	HazWaste
( )	29CFR 1910.1001/1926.1101	Asbestos
(X)	29CFR 1910.134	Respiratory Protection
(X)	ANSI Z117.1-1995	Sec. 16 Confined Spaces

And is MEDICALLY QUALIFIED. Restrictions on reverse.

Issue date 10-4-92 Exam Due 10-4-93

Provider: Timothy R. Oesch, M.D.

RESPIRATOR INFORMATION

MODEL	TYPE	SIZE	App #	PT
MSA ULTRA-TWIN	FULL	Large	TC-84A-0181	100

VALID WITH CURRENT MEDICAL CLEARANCE

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME (Last, First, Middle Initial): MADAJ, AMBROSE J.

S.S. #: 440-62-9608

HAS RECEIVED BASIC INSTRUCTION ON PROPER RESPIRATOR USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE: 10.4.02

EXP. DATE: 10.4.03

TECHNICIAN SIGNATURE:

NUS CORPORATION

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

AMBROSE MADAJ

has successfully completed a 40 hour course of instruction in

HAZARDOUS MATERIALS HANDLING

prepared and conducted by the
NUS Corporation,
Pittsburgh, Pennsylvania

JANUARY 25 - 29, 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

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

This card certifies that
Jim Madaj
has successfully completed
the 29 CFR 1910.146
for
8-Hour Confined Space
Training for
Entry/Attendant
on
October 23, 1997

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

This card certifies that
Jim Madaj
has successfully completed
the 29 CFR 1910.120
8-Hour Refresher
Training for
Hazardous Waste
Operations
on
September 9, 1997

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

This card certifies that
Jim Madaj
has successfully completed
the 29 CFR 1910.120
8 Hour Supervisor
Training for
Hazardous Waste
Operations
on
January 4, 1994

OSHA

U.S. Department of Labor
Occupational Safety and Health Administration

This is to certify that
Jim Madaj
has successfully completed a 10-hour Occupational Safety and Health Training Course in
Construction Safety & Health
12-19 19 95
(Trainer)
Robert Chavarria

☆ U.S. GPO: 1994—646-677

Certificate of Completion

Jim Madaj

In Recognition of Having Successfully Completed

HAZWOPER 8 HOUR ANNUAL REFRESHER

On

August 26, 2002

in accordance with

OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-02-1187

CONCENTRA MEDICAL CENTERS
OAK RIDGE, TENNESSEE 37830

MEDICAL SURVEILLANCE CERTIFICATE

Ray, Ralph 413-04-1854

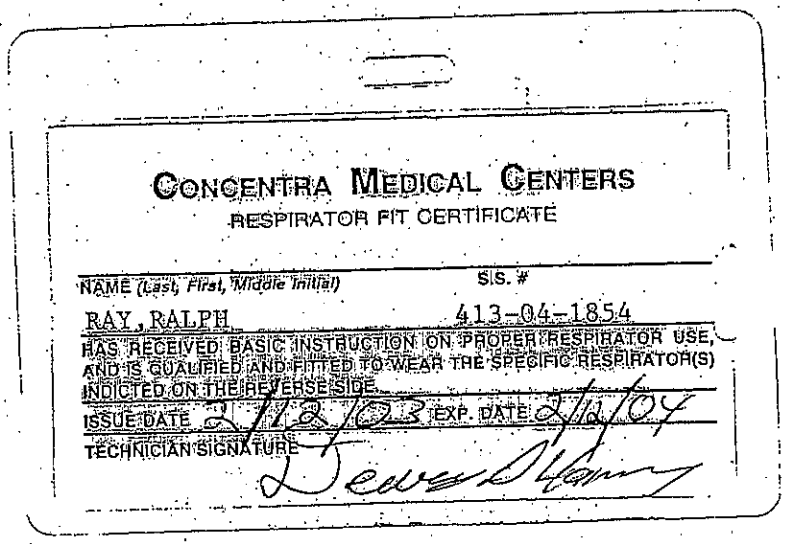
Has completed a physical exam in accordance with:

- (X) 29CFR 1910.120 HazWaste
- ( ) 29CFR 1910.1001/1926.1101 Asbestos
- (X) 29CFR 1910.134 Respiratory Protection
- (X) ANSI Z117.1-1995 Sec. 16 Confined Spaces

And Is MEDICALLY QUALIFIED. Restrictions on reverse

Issue date 2-12-03 Exam Due 2-12-04

Provider Kimberly R. Oesch, M.D.



CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

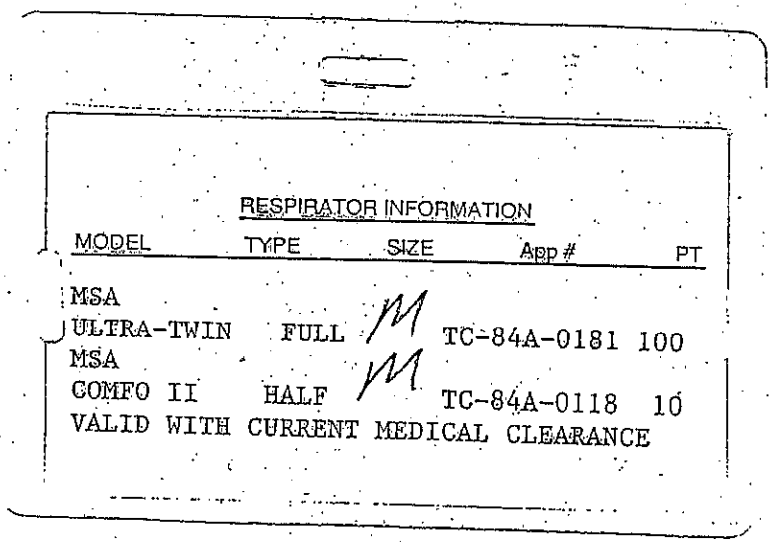
NAME (Last, First, Middle Initial) S.S. #

RAY, RALPH 413-04-1854

HAS RECEIVED BASIC INSTRUCTION ON PROPER RESPIRATOR USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 2/12/03 EXP. DATE 2/12/04

TECHNICIAN SIGNATURE Dewey Stamey

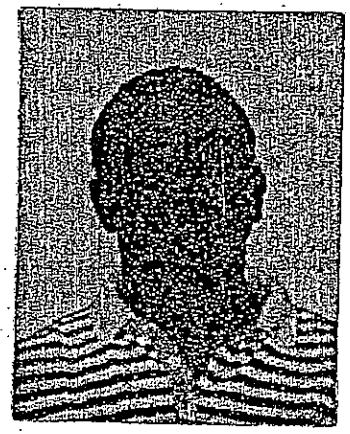


RESPIRATOR INFORMATION

MODEL	TYPE	SIZE	App #	PT
MSA ULTRA-TWIN	FULL	M	TC-84A-0181	100
MSA COMFO II	HALF	M	TC-84A-0118	10

VALID WITH CURRENT MEDICAL CLEARANCE

Date Completed:
5/19/2000



Receipt #
87188

International Union of Operating Engineers
Hazmat Training Program

Local DOE

This is to certify that
Ralph F. Ray

has successfully completed the 40-hour Hazardous Waste Training Program specifically designed for workers in accordance with OSHA at 29 CFR 1910.120.

Certified Instructor

Certificate of Completion

Ralph Ray

In Recognition of Having Successfully Completed

Confined Space Program - Authorized Entrant

on

June 16, 2000

in accordance with

OSHA 29CFR1910.146 Permit-Required Confined Spaces

STEP Inc.

Timothy M. Hughes

W2-00-0003

Certificate of Completion

Ralph Ray

In Recognition of Having Successfully Completed

Confined Space Program - Attendant

on

June 16, 2000

in accordance with

OSHA 29CFR1910.146 Permit-Required Confined Spaces

Timothy M. Hughes

W3-00-0003

OSHA 7000 2006 06
Ralph Ray
General Industry Safety & Health
Date

Certificate of Completion

Presented To

Ralph F. Ray

For Successful Completion of

Lead Hazard Awareness Training

on

January 30, 2001

In Accordance with

OSHA 29 CFR 1926.62

CCR, Title 8, Section 1532.1

Jeff Sickau, OHST

PSC-01-0006

PRINCIPLES

1. Line Management Responsibility for Safety
2. Clear Roles and Responsibilities
3. Competence Commensurate With Responsibility
4. Balanced Priorities
5. Identification of Safety Standards and Requirements
6. Hazard Control Tailored to Work Being Performed
7. Operations Authorization

Worker Involvement

FUNCTIONS

1. Define the Scope of Work
2. Analyze the Hazards
3. Develop and Implement Hazard Controls
4. Perform Work Within Controls
5. Provide Feedback and Continuous Improvement

ISMS

This card certifies that the employee whose name appears on the face of this card has successfully completed the stated core training course. This is subject to the limitations of this specific training as identified in the DOE Implementation Guidance Manuals. Upon successful completion of site-specific training at DOE sites, unescorted access shall be granted to this individual subject to the access limitations of this core training.

NOTE: This card does not certify that the employee is qualified to wear respiratory protection equipment.

This card shall only be issued to DOE employees, DOE contractors and subcontractors in direct support of DOE funded work. DO NOT duplicate this card for use OFF-SITE. This card may be duplicated only when used as proof of training on-site. Additional alterations may also be made when used as proof of training for on-site use (card color change, add/delete/change words, etc).

79407647

UNITED STATES
DEPARTMENT OF ENERGY
OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

CERTIFICATE OF CORE RADIOLOGICAL TRAINING

Radiological Worker II
(Course Title)

Ralph Ray
(Employee Name)

has successfully completed the above-standardized core training course and shall be granted access to DOE sites subject to the limitations stated on the back of this card.

8/12/02
Date of Training

Training Representative
ETTP Task Judge

Card No./Employee ID No.
62747

BECHTEL JACOBS Company LLC

Ralph Ray
62747

GET
RWZ
BIO
HAZ
RESP

Requalification Dates:

General Employee Training: 07/01/2004
Radiation Worker Training 2: 08/13/2004
Bioassay Baseline: Yes
HAZWOPER Training: 07/02/2003
Respirator Training & Fit: 04/28/2003

Verified By

03

This certifies that

ROBERT A. RIORDAN

has successfully completed
training in

Respirator Fit Testing, Use & Care

Authorized Signature

1/12/98
Date

This recognizes that Bob Riordan has completed the requirements for **Adult CPR**

conducted by **Appalachian Chapter**

Date completed 4-4-93

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.

American Red Cross
We'll be there.

Advanced Sciences, Inc.

In recognition of successful completion of the
8-Hour Supervisory Training Course
for hazardous waste workers,
This certificate is presented to

Robert Riordan

11-31-89

Application and Safety Officer — Date

RESPIRATOR QUALIFICATION CARD

NAME: ROBERT A. RIORDAN

DATE QUALIFIED: 3/11/87

TYPE RESPIRATOR	MODEL	SIZE
APR	SCOTT FF	S
APR	SCOTT 1/2F	M
SCBA	SCOTT 2.2	—
AIRLINE	SCOTT	

CERTIFIED BY:

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

This card certifies that
Bob Riordan
has successfully completed
the 29 CFR 1910.120
8 Hour Refresher
Training for
Hazardous Waste
Operations
on
December 13, 1994

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

This card certifies that
Robert Riordan
has successfully completed
the 29 CFR 1910.120
8 Hour Refresher
Training for
Hazardous Waste
Operations
on
December 12, 1995

The Electrical Standard: What You Need To Know

Verification of participation and completion of the above Training Program

J.J. Keller & Associates, Inc.
Regulatory & Compliance Publications, Products & Services
3003 W. Breezewood Lane
P.O. Box 368
Neenah, WI 54957-0368
414/722-2848

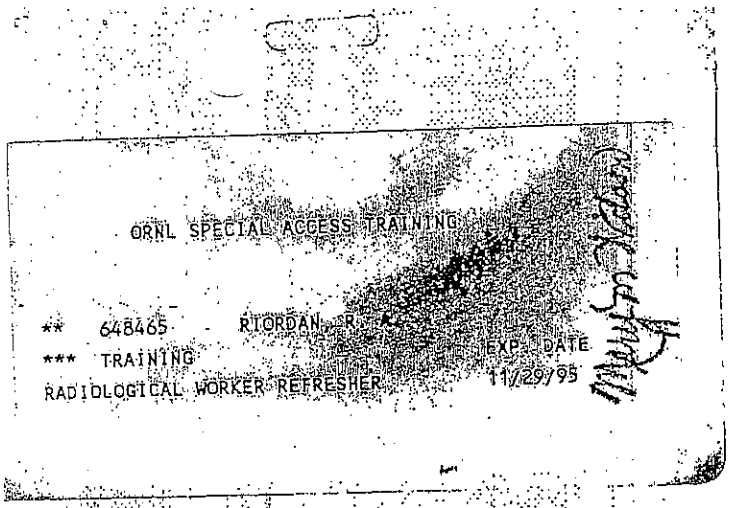
Employee R.A. Riordan

Instructor R.W. Sweeney

Company Teledyne Brown Engineering

September 30, 1997

18-BC


ORNL SPECIAL ACCESS TRAINING
** 648465 RIORDAN, R. A.
*** TRAINING EXP. DATE
RADIOLOGICAL WORKER REFRESHER 11/29/95

Oak Ridge National Laboratory

Certificate of Completion

Presented to

R. A. Riordan

In Recognition of Having Successfully Completed* the

Radiation Worker Training Program

November 11-12, 1992

*[Certification for respirator use not complete]

Ronald M. Bishop, Director
Office of Safety and Health Protection

D. Allen White, Head
Technical Resources and Training Section
Office of Safety and Health Protection

B. Jean Thorpe, Group Leader
Radiation Protection/Monitoring
Office of Safety and Health Protection

Certificate of Completion

Presented To

ROBERT A. RIORDAN

in Recognition of Having Successfully Completed

the Prescribed Course of Study for

Hazards & Protection

D. J. McNally

Donald Fawn

OGDEN

CERTIFICATE OF COMPLETION

Presented to

Bob Riordan

of

Ogden Environmental and Energy

In Recognition of Having Successfully
Completed the
8 Hour Refresher Training for
Hazardous Waste Operations
OSHA 29 CFR 1910.120

Dawn Henderlight

Dawn Henderlight

December 13, 1994

OGDEN

CERTIFICATE OF COMPLETION

Presented to

Robert A. Riordan

of

Ogden Environmental & Energy Services

In Recognition of Having Successfully
Completed the

8 Hour Refresher Training for
Hazardous Waste Operations
OSHA 29 CFR 1910.120

Margaret M. Masley

Margaret M. Masley

December 12, 1995

TRAINING CERTIFICATION

This certifies that

Robert A. Riordan

has successfully completed the following training:

LOSS CONTROL SELF STUDY COURSE

Date(s) July 26, 2001

Location Oak Ridge, TN

(14109)

Instructor(s) Michael P. McSherry

Don Rogers

FOSTER WHEELER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

FOSTER WHEELER ENVIRONMENTAL CORPORATION

TO: Robert Riordan LOCATION: Oak Ridge, TN

DATE: July 26, 2001

FROM: Don Rogers/Michael McSherry

SUBJECT: LOSS CONTROL SELF-STUDY COURSE

Congratulations on your successful completion of the Loss Control Self-Study Course!

Your participation plays a key role in the success of our Health and Safety Program. We have no doubt you will find this course of real value in your every day work. We want to personally express our appreciation in your dedication and commitment in completing this course and for "Doing It Right."

Should you desire to receive 3 CEU's for the course, please contact Beth Levine in the Atlanta office.

DR:MMS:kk

2300 Lincoln Highway East, One Oxford Valley, Suite 200, Langhorne, PA 19047-1829
Phone (215) 702-4000 Fax (215) 702-4045

CONCENTRA MEDICAL CENTERS
1030 OAK RIDGE TURNPIKE
OAK RIDGE, TENNESSEE 37830
(865)425-4640

PHYSICIAN'S STATEMENT

Shoffner, Tim J.

DATE OF EXAM: 2-19-03

Employer: Step Inc
SSN: 411-06-4206 DOB: 06/17/1962
Case Date: 02/19/2003

TYPE OF EXAM: ☐ *BASELINE* ☒ *ANNUAL* ☐ *EXIT*

OPINION OF RISK/MEDICAL CLEARANCE FOR HAZARDOUS WASTE OPERATIONS

I have reviewed the results of the occupational and medical history, physical examination and laboratory tests and based upon these, I certify that this individual:

[X] *has no medical condition that would place the individual at increased risk of health impairment from hazardous waste site work, when conducted under the conditions of adequate training and a health and safety plan.*

[ ] *has a medical condition that would place the individual at increased risk of health impairment from hazardous waste site work.*

[ ] *has a medical condition which may require special consideration by the company.*

[ ] *deferred, pending further evaluation.*

MEDICAL CLEARANCE FOR RESPIRATOR USE

Based upon the examination, I certify that this individual:

[X] *is medically qualified to use properly fitted respiratory protection equipment.*

[ ] *is NOT medically qualified to use respiratory protection equipment.*

[X] *qualified for Confined Space Entry.*

[ ] *is NOT qualified for Confined Space Entry.*

[ ] *deferred, pending further evaluation.*

Comments/Restrictions

[ ] *The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.1001, 1926.1101, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.*

[X] *The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.*

[ ] *Corrective lenses required* [ ] *Deficient stereo depth perception.*

[X] *Hearing protection recommended* [X] *Recommend tetanus toxoid immunization be updated.* Every 10 yrs.

EMPLOYEE NOTIFICATION

This individual has been informed of the results of this medical examination. Detected medical conditions which require additional examinations or treatment have been explained and applicable follow-up recommended.

Signature Of Provider: Timothy R. Oesch, M.D. Date: 3-3-03

Amended (w)

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME (Last, First, Middle Initial) SHOFFNER, TIM J.

S.S. # 411-06-4206

HAS RECEIVED BASIC INSTRUCTION ON PROPER RESPIRATOR USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 2-19-03 EXP. DATE 2-19-04

TECHNICIAN SIGNATURE Denise Walker

RESPIRATOR INFORMATION

MODEL	TYPE	SIZE	App #	PT
MSA		Small		
ULTRA-TWIN/VUE	FULL		TC-84A-0181	100

VALID WITH CURRENT MEDICAL CLEARANCE

Certificate of Completion

Tim Shoffner

In Recognition of Having Successfully Completed

HAZWOPER 8 HOUR ANNUAL REFRESHER

On

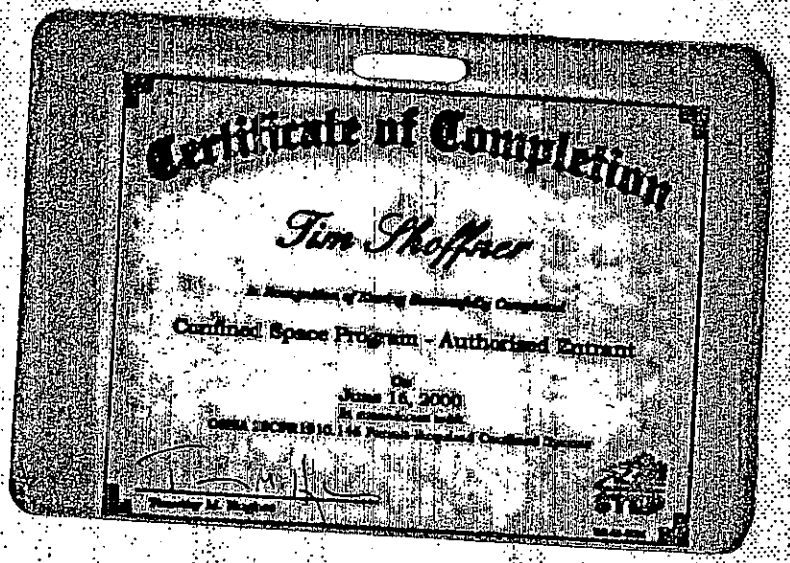
February 18, 2003

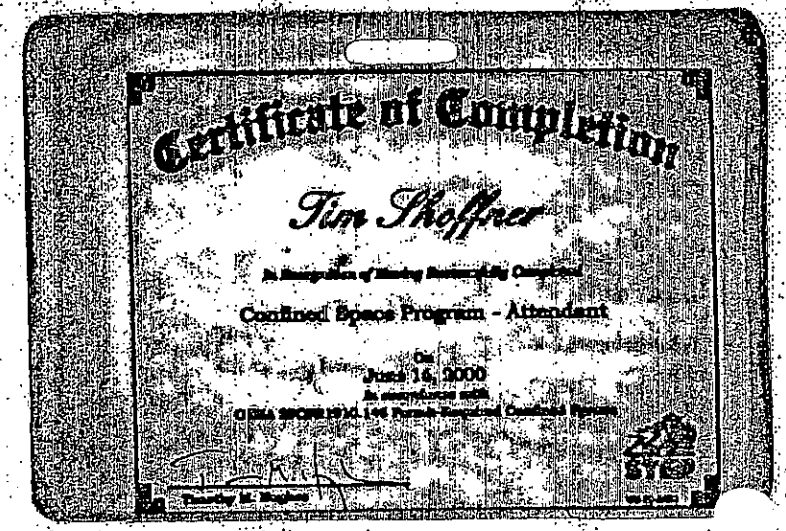
in accordance with

OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-03-1455


Certificate of Completion
Tim Skoffner
Confined Space Program - Authorized Entrant
June 15, 2000


Certificate of Completion
Tim Skoffner
Confined Space Program - Attendant
June 15, 2000

American Red Cross
We'll be there.

This recognizes that

TIM SHOFFNER

has completed the requirements for

Adult CPR

conducted by

Appalachian Chapter

Date completed 11-9-2001

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.

American Red Cross
We'll be there.

This recognizes that

TIM SHOFFNER

has completed the requirements for

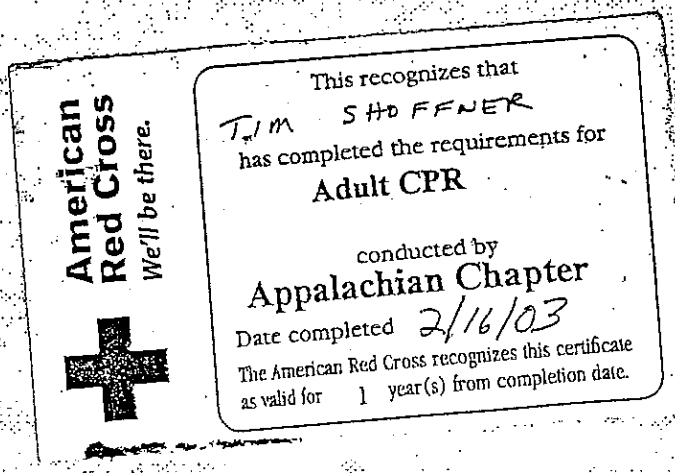
First Aid Basics

conducted by

Appalachian Chapter

Date completed 11-9-2001

The American Red Cross recognizes this certificate as valid for 3 year(s) from completion date.



American Red Cross
We'll be there.

This recognizes that

TIM SHOFFNER

has completed the requirements for

Adult CPR

conducted by

Appalachian Chapter

Date completed 2/16/03

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.

Certificate of Completion

Presented to

Tim Shoffner

of

STEP, Inc.

For Successful Completion of

Emergency Action/Fire Prevetion; Lockout-Tagout; Welding/Catting; Confined Space Entry; Fall Protection; Asbestos & Lead Awareness; UST Removal; Excavation Safety; Hoisting & Rigging; Electrical Safety; and PPE

T. R. Crouse

T.R. Crouse, M.S.

February 10, 2003

Certification of Completion

Presented to

STEP Inc.

Tim Shoffner

of

STEP, Inc.

In Recognition of Having Successfully Completed the
40-Hour Training for
Hazardous Waste Operations and Emergency Response
in accordance with
OSHA 29 CFR 1910.120

T. R. Crouse

T.R. Crouse **November 20, 1998**


OSHA
700020605
U.S. Department of Labor
Occupational Safety and Health Administration
Jim Shotner
has successfully completed a 10-hour Occupational Safety and Health
training course in
General Industry Safety & Health

CONCENTRA MEDICAL CENTERS
1030 OAK RIDGE TURNPIKE
OAK RIDGE, TENNESSEE 37830
(865)425-4640

PHYSICIAN'S STATEMENT

Williams, Jeffrey C.

DATE OF EXAM: 6-20-03

Employer: Step Inc
SSN: 413-04-2904 DOB: 06/12/1959
Case Date: 06/20/2003

TYPE OF EXAM: [X] BASELINE [ ] ANNUAL [ ] EXIT

OPINION OF RISK/MEDICAL CLEARANCE FOR HAZARDOUS WASTE OPERATIONS

I have reviewed the results of the occupational and medical history, physical examination and laboratory tests and based upon these, I certify that this individual:

[X] has no medical condition that would place the individual at increased risk of health impairment from hazardous waste site work, when conducted under the conditions of adequate training and a health and safety plan.

[ ] has a medical condition that would place the individual at increased risk of health impairment from hazardous waste site work.

[ ] has a medical condition which may require special consideration by the company.

[ ] deferred, pending further evaluation.

MEDICAL CLEARANCE FOR RESPIRATOR USE

Based upon the examination, I certify that this individual:

[ ] is medically qualified to use properly fitted respiratory protection equipment.

[X] is NOT medically qualified to use respiratory protection equipment.

[X] qualified for Confined Space Entry.

[ ] is NOT qualified for Confined Space Entry.

[ ] deferred, pending further evaluation.

Comments/Restrictions
[ ] The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.1001, 1926.1101, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.

[X] The individual has undergone a physical examination in accordance with OSHA Standards 29CFR 1910.120, 29CFR 1910.134 and ANSI Standard Z117.1-1995, Section 16.

[X] Corrective lenses required [ ] Deficient stereo depth perception.
[X] Hearing protection recommended [X] Recommend tetanus toxoid immunization be updated. Every 10 yrs.

Far w/ cart depth

EMPLOYEE NOTIFICATION

This individual has been informed of the results of this medical examination. Detected medical conditions which require additional examinations or treatment have been explained and applicable follow-up recommended.

Signature Of Provider: Dana E Cope PA-C Date: 7-2-03
Kenneth R. Orsek, M.D.

RESTRICTIONS *(if applicable)*

Corrective lenses required.
Fav, Near, & Depth

SURVEILLANCE

CONCENTRA MEDICAL CENTERS
OAK RIDGE, TENNESSEE 37830
MEDICAL SURVEILLANCE CERTIFICATE

Williams, Jeffrey 413-04-2904

Has completed a physical exam in accordance with:

(x) 29CFR 1910.120 HazWaste
( ) 29CFR 1910.1001/1926.1101 Asbestos
( ) 29CFR 1910.134 Respiratory Protection
(x) ANSI Z117.1-1995 Sec. 16 Confined Spaces

And is MEDICALLY QUALIFIED. Restrictions on reverse.

Issue date 6-20-03 Exam Due 6-20-04

Provider Don Cope PA-C

C4432SURVEILLANCE

This recognizes that

Jeffrey Williams

has completed the requirements for

Adult CPR

conducted by

Appalachian Chapter

Date completed 4-4-03

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.

This recognizes that

Jeffrey Williams

has completed the requirements for

First Aid Basics

conducted by

Appalachian Chapter

Date completed 4/4/03

The American Red Cross recognizes this certificate as valid for 3 year(s) from completion date.

STATE OF GEORGIA
CATHY COX, Secretary of State

State Board of Registration for Prof. Engineer & Land Surveyor
Professional Engineer
LICENSE NO. PE028348

Jeffrey C Williams
Step Inc. 1006 Floyd Culler Court
Oak Ridge TN 37830

EXP DATE - 12/31/2004

This recognizes that

Jeffrey Williams

has completed the requirements for

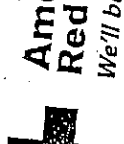
Adult CPR

conducted by

Appalachian Chapter

Date completed 4-4-03

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.



This recognizes that

Jeffrey Williams

has completed the requirements for

First Aid Basics

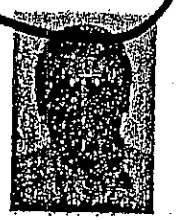
conducted by

Appalachian Chapter

Date completed 4/4/03

The American Red Cross recognizes this certificate as valid for 3 year(s) from completion date.

Date Completed:
9/17/2002



International Union of Operating Engineers
Hazmat Training Program

Local DOE

This is to certify that

Jeffrey C. Williams

has successfully completed the required annual 8-hour refresher class specifically designed for workers in accordance with OSHA at 29 CFR 1910.120.

Receipt #

92383

Certified Instructor

Seaver Environmental

Proudly Presents This
Certificate to

Jeffrey C Williams

for completing the initial 40-hour training in
Hazardous Waste Operations and Emergency Response
at Oak Ridge, Tennessee on 06 Apr 92
to satisfy OSHA rules, 29 CFR Part 1910.120

Certificate Number: 4
SSAN: 413-04-2904

Gary Seaver, Trainer

Seaver Environmental
Rt. 1, Box 18
Ridge Road
Lancing, TN 37770
615-346-7459

Certificate of Completion

David Blank

In Recognition of Having Successfully Completed

HAZWOPER 8 HOUR ANNUAL REFRESHER

On

February 18, 2003

in accordance with

OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-03-1452

Date Completed:
8/27/2001

International Union of Operating Engineers
Hazmat Training Program

Local DOE

This is to certify that

David Leonard Blank

has successfully completed the required annual 8-hour refresher class specifically designed for workers in accordance with OSHA at 29 CFR 1910.120.

Certified Instructor

Receipt #
89177

HAZARDOUS WASTE SUPERVISOR
TRAINING COURSE

NAME: DAVID L BLANK
S.S.#: 473-56-3986
CERTIFICATE #: 47356398641341001
DATE COMPLETED: 10/15/01
REFRESHER DATE: 10/15/02

COMPLIES WITH OSHA REGULATION 29 CFR 1910.120

Certificate of Completion

David Blank

In Recognition of Having Successfully Completed
HAZWOPER 8 HOUR ANNUAL REFRESHER
on
February 18, 2003
in accordance with
OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-03- 1452

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME (Last, First, Middle Initial) BLANK, DAVID L.

S.S. # 473-56-3986

HAS RECEIVED BASIC INSTRUCTION ON PROPER RESPIRATOR USE AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 8/19/03 EXP. DATE 8/19/04

TECHNICIAN SIGNATURE Clone a Wilson

Certificate of Completion

David L. Blank

In Recognition of Having Successfully Completed

Confined Space Program - Attendant

on

June 16, 2000

In accordance with

OSHA 29CFR1910.146 Permit-Required Confined Spaces

Timothy M. Hughes

STEP

Certificate of Completion

David L. Blank

In Recognition of Having Successfully Completed

Confined Space Program - Authorized Entrant

on

June 16, 2000

In accordance with

OSHA 29CFR1910.146 Permit-Required Confined Spaces

Timothy M. Hughes

STEP

CONCENTRA MEDICAL CENTERS
OAK RIDGE, TENNESSEE 37830
MEDICAL SURVEILLANCE CERTIFICATE

Blank, David L. 473-56-3986

Has completed a physical exam in accordance with:

- (X) 29CFR 1910.120 HazWaste
- ( ) 29CFR 1910.1001/1926.1101 Asbestos
- (X) 29CFR 1910.134 Respiratory Protection
- (X) ANSI Z117.1-1995 Sec. 16 Confined Spaces

And is MEDICALLY QUALIFIED. Restrictions on reverse.

Issue date 2-19-03 Exam Due 2-19-04

Provider: [signature] PA-C

OSHA 700020610

U.S. Department of Labor
Occupational Safety and Health Administration

David Blank

has successfully completed a 10-hour Occupational Safety and Health Training Course in

General Industry Safety & Health

[signature] (Trainer) [illegible] (Date)

American Red Cross
We'll be there.

This recognizes that

DAVID BLANK

has completed the requirements for

First Aid Basics

conducted by

Appalachian Chapter

Date completed 11-9-2001

The American Red Cross recognizes this certificate as valid for 3 year(s) from completion date.

American Red Cross
We'll be there.

This recognizes that

DAVID BLANK

has completed the requirements for

Adult CPR

conducted by

Appalachian Chapter

Date completed 2-17-2003

The American Red Cross recognizes this certificate as valid for 1 year(s) from completion date.

Certification of Completion

Presented to

STEP Inc.

David L. Blank

of

STEP, Inc.

In Recognition of Having Successfully Completed the
40-Hour Training for
Hazardous Waste Operations and Emergency Response
in accordance with
OSHA 29 CFR 1910.120

T. R. Crouse

T.R. Crouse

November 20, 1998

STEP Inc.

Certification of Completion

Presented to

L. Burke Arthur

of

Solutions To Environmental Problems, Inc.

In Recognition of Having Successfully Completed the

40 Hour Hazardous Waste Operations Training

in accordance with OSHA 29 CFR 1910.120

Michael D. Palmer

Michael D. Palmer, CSP, CIH, CHMM

March 26, 1993

Certificate of Completion

Burke Arthur

In Recognition of Having Successfully Completed

HAZWOPER 8 HOUR ANNUAL REFRESHER

On

August 22, 2002

in accordance with

OSHA 29 CFR 1910.120(e)(8)/1926.65(e)(8) HAZWOPER Standard

Steven W. Skipper, CIH, CSP

KSR-02-1198

Certification of Completion
Presented to

L. Burke Arthur

of

Solutions To Environmental Problems, Inc.

In Recognition of Having Successfully Completed the training for

"Excavation/Competent Person"

in accordance with OSHA 29 CFR 1926

Michael D. Palmer, CSP, CIH, CHMM

March 16, 1994

CONCENTRA MEDICAL CENTERS

RESPIRATOR FIT CERTIFICATE

NAME *(Last, First, Middle Initial)* ARTHUR, LESLIE B.

S.S.# 408-90-6887

HAS RECEIVED BASIC INSTRUCTION ON PROPER USE, AND IS QUALIFIED AND FITTED TO WEAR THE SPECIFIC RESPIRATOR(S) INDICTED ON THE REVERSE SIDE.

ISSUE DATE 03-10-03 EXP. DATE 03-10-04

TECHNICIAN SIGNATURE Jerrie Slack

RESPIRTATION INFORMATION

MODEL	TYPE	SIZE	App#	PT
MSA ULTRA-TWIN	FULL VUE	M	TC-84A-0181	100
MSA COMFO II	HALF	M	TC-84A-0118	10

VALID WITH CURRENT MEDICAL CLEARANCE

pH₂ Environmental, Inc.

Paul Gibson

has completed and satisfactorily passed an examination covering the contents of the course entitled:

OSHA 40 Hour Hazardous Waste Worker Training

in accordance with 29 CFR 1910.120 regulations and is authorized to conduct operations involving hazardous waste materials.

258238268
Certificate Number

October 3, 1994
Expiration Date

Corporate Safety and Health Director

RMT, Inc.

100 Verdae Blvd.
Greenville, SC 29607-3825

Awards This Certificate To

Paul Gibson

of A.E. Drilling Services, Inc.

For Successful Completion of the

8-Hour HAZWOPER Refresher

29CFR 1910.120(e)(8)

February 3, 2003

In testimony whereof, this certificate is awarded
this 3rd day of February 2003

Lead Instructor / Trainer

RMT®

Certificate Number: GVL-03-142

NORTH HILLS
MEDICAL CENTER

OCCUPATIONAL MEDICINE DEPARTMENT

JAMES W. McPHAIL, M.D.

PHYSICIAN'S WRITTEN OPINION ON MEDICAL FITNESS FOR
WORK IN HAZARDOUS WASTE AND EMERGENCY RESPONSE OPERATIONS
AND FOR THE USE OF RESPIRATORS

EMPLOYEE'S FULL NAME: Paul Gibson

EMPLOYEE'S SS#: 258-23-8269

EXAMINATION DATE: 10/18-02

/ ON THE ABOVE DATE, I DID NOT DETECT ANY MEDICAL CONDITION THAT WOULD PLACE THE NAMED EMPLOYEE AT INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT AS A RESULT OF:

- WORK IN HAZARDOUS WASTE OPERATIONS,
- WORK IN EMERGENCY RESPONSE ACTIVITIES,
- WORK IN RESPIRATORY PROTECTION DEVICES (WITH POSITIVE OR NEGATIVE FACEPIECE PRESSURES), OR
- WORK IN HOT ENVIRONMENTS (POSSIBLY WITH RESPIRATORS AND HEAVY PROTECTIVE GARMENTS).

____ ON THE ABOVE DATE, I DID DETECT SUCH A MEDICAL CONDITION.

I RECOMMEND THE FOLLOWING LIMITATIONS ON THE EMPLOYEE'S WORK ACTIVITIES:

_____

_____

_____

I HAVE INFORMED THE EMPLOYEE OF THE RESULTS OF THIS MEDICAL EXAMINATION AND ANY MEDICAL CONDITIONS THAT REQUIRE FUTHER EXAMINATION OR TREATMENT. THE COMPLETE REPORT OF EXAMINATIONS AND TESTS WILL BE MAINTAINED AT THIS FACILITY UNTIL WE RECEIVE OTHER INSTRUCTIONS. THE EMPLOYEE MAY OBTAIN COPIES OF ANY MATERIAL IN HIS FILE UPON REQUEST.

JAMES W. MCPHAIL, MD

J.W. McPhail, M.D.
800 Perham Road
Greenville SC 29615
SC # 11011

DO NOT PEEL CARD FROM A CORNER

To remove card from backing

- Bend form back from the outside edge
- Pull card off backing

2003 - 2004
South Carolina Environmental Certification Board

WELL DRILLER

PAUL A GIBSON
102 BARKSDALE DR
WASHINGTON GA 30673

Lic # B 01655

Issue Date 05/19/2003 AE DRILLING

Expiration Date 06/30/2004

- Attached is your pocket card for the current licensing period. Your certification expires on the date indicated.

- Carry this card with you at all times you are working. You may make a copy of it if your employer requires one.

- You are required to immediately notify this Board in writing of any name, address or employment change. (Name changes require a copy of legal documentation, i.e. marriage license, divorce decree, court order)

865-481-3049

Miller Drilling Company Qualitative Fit Test Record

Qualitative Fit Test Record

Name: Paul Gibson Date 5-30-01

Employee ID / SSN: 858-23-8268

Respirator: 3M 6000 series Size: Large

Sensitivity Test:

Isoamyl Acetate (Banana Oil)
Saccharin # Squeezes (10) (20) (30)
Bitter Aerosol # Squeezes (10) (20) (30)
Irritant Smoke

Results:

Pass ( ) Fail ( ) N/A ( )
Pass ( ) Fail ( ) N/A ( )
Pass (✓) Fail ( ) N/A ( )
Pass ( ) Fail ( ) N/A ( )

Fit Test Agent:

Isoamyl Acetate
Saccharin
(Bitter Aerosol)
Irritalant Smoke

Filter / Cartridge:

Organic Vapor Cartridge
Particulate Cartridge
(Particulate Filter)
100 Level Particulate Filter

Results:

Pass ( ) Fail ( ) N/A ( )
Pass ( ) Fail ( ) N/A ( )
Pass (✓) Fail ( ) N/A ( )
Pass ( ) Fail ( ) N/A ( )

Comments:

Fit Test Repeated Before: 5/30/02

Test Conductor: Sabrina Arnold

Employee Signature: Paul Gibson

TECHNICAL ENVIRONMENTAL SERVICE TRAINING INSTITUTE

certifies that

CARLOS SWAIN

has successfully met the 29 CFR 1910.120 certificate requirements for the course entitled

40 HOUR HEALTH & SAFETY TRAINING
– GENERAL SITE WORKER (E-3-1) –

and in evidence thereof is awarded this

CERTIFICATE OF COMPLETION

on the 13TH day of JANUARY , 19 95

JANUARY 13, 1995
Passed Exam

HSW-01746
Certificate Number

TEST institute

Anthony L. Egitto, Director

1110 Navaho Dr. • Suite 602 • Raleigh, North Carolina 27609 • 919-876-8440

RMT, Inc.

100 Verdae Blvd.
Greenville, SC 29607-3825

Awards This Certificate To

Carlos Swain

of A.E. Drilling Services, Inc.

For Successful Completion of the

8-Hour HAZWOPER Refresher

29CFR 1910.120(e)(8)

February 3, 2003

In testimony whereof, this certificate is awarded
this 3rd day of February 2003

Lead Instructor / Trainer

RMT®

Certificate Number: GVL-03-147

NORTH HILLS
MEDICAL CENTER

JAMES W. McPHAIL M.D.

PHYSICIAN'S WRITTEN OPINION ON MEDICAL FITNESS FOR
WORK IN HAZARDOUS WASTE AND EMERGENCY RESPONSE OPERATIONS
AND FOR THE USE OF RESPIRATORS

EMPLOYEE'S FULL NAME: Curtis C. Swain

EMPLOYEE'S SS#: 266-13-1349

EXAMINATION DATE: 10-28-02

✓ ON THE ABOVE DATE, I DID NOT DETECT ANY MEDICAL CONDITION THAT WOULD PLACE THE NAMED EMPLOYEE AT INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT AS A RESULT OF:

- WORK IN HAZARDOUS WASTE OPERATIONS,
- WORK IN EMERGENCY RESPONSE ACTIVITIES,
- WORK IN RESPIRATORY PROTECTION DEVICES (WITH POSITIVE OR NEGATIVE FACEPIECE PRESSURES), OR
- WORK IN HOT ENVIRONMENTS (POSSIBLY WITH RESPIRATORS AND HEAVY PROTECTIVE GARMENTS).

_____ ON THE ABOVE DATE, I DID DETECT SUCH A MEDICAL CONDITION.

I RECOMMEND THE FOLLOWING LIMITATIONS ON THE EMPLOYEE'S WORK ACTIVITIES:

_____

_____

_____

I HAVE INFORMED THE EMPLOYEE OF THE RESULTS OF THIS MEDICAL EXAMINATION AND ANY MEDICAL CONDITIONS THAT REQUIRE FUTHER EXAMINATION OR TREATMENT. THE COMPLETE REPORT OF EXAMINATIONS AND TESTS WILL BE MAINTAINED AT THIS FACILITY UNTIL WE RECEIVE OTHER INSTRUCTIONS. THE EMPLOYEE MAY OBTAIN COPIES OF ANY MATERIAL IN HIS FILE UPON REQUEST.

JAMES W. MCPHAIL, MD

A.E. DRILLING SERVICES, INC.

RESPIRATORY PROTECTION PROGRAM

Mandatory "Qualitative Fit Testing" of employees according to the Occupational Safety and Health Administration (OSHA) asbestos regulations for the Construction Industry (29 CFR 1926.58) and General Industry (29 CFR 1910.1001) Appendix C.

I hereby certify that I have been "Qualitatively Fit Tested" and trained in the use of full face air purifying respirators.

A.E. Drilling Services, Inc. Employee: Carlos Swain

Date: Oct. 28, 2002

Fit Testing Conductor: Bill Barnes

Type of Respirator: Full Face

Manufacturer: North

Model: 76008-A

Size: Large

Approval Number: 1410-004

Testing Agent Used: North Bandana Ampules

Linda H. Suiggs

COMMISSION EXPIRES DEC 19, 2011
GREENVILLE, SOUTH CAROLINA

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Marty L. King

has successfully completed a 5-day course of instruction in

HAZARDOUS WASTE SITE HEALTH AND SAFETY TRAINING

conducted by

WESTINGHOUSE ENVIRONMENTAL SERVICES

in compliance with OSHA 29CFR 1910.120

August 7-11, 1989
DATE

Health and Safety
Training Officer

Manager
Environmental Safety & Health

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Marty L. King

has successfully completed a 5-day course of instruction in

HAZARDOUS WASTE SITE HEALTH AND SAFETY TRAINING

conducted by

WESTINGHOUSE ENVIRONMENTAL SERVICES

in compliance with OSHA 29CFR 1910.120

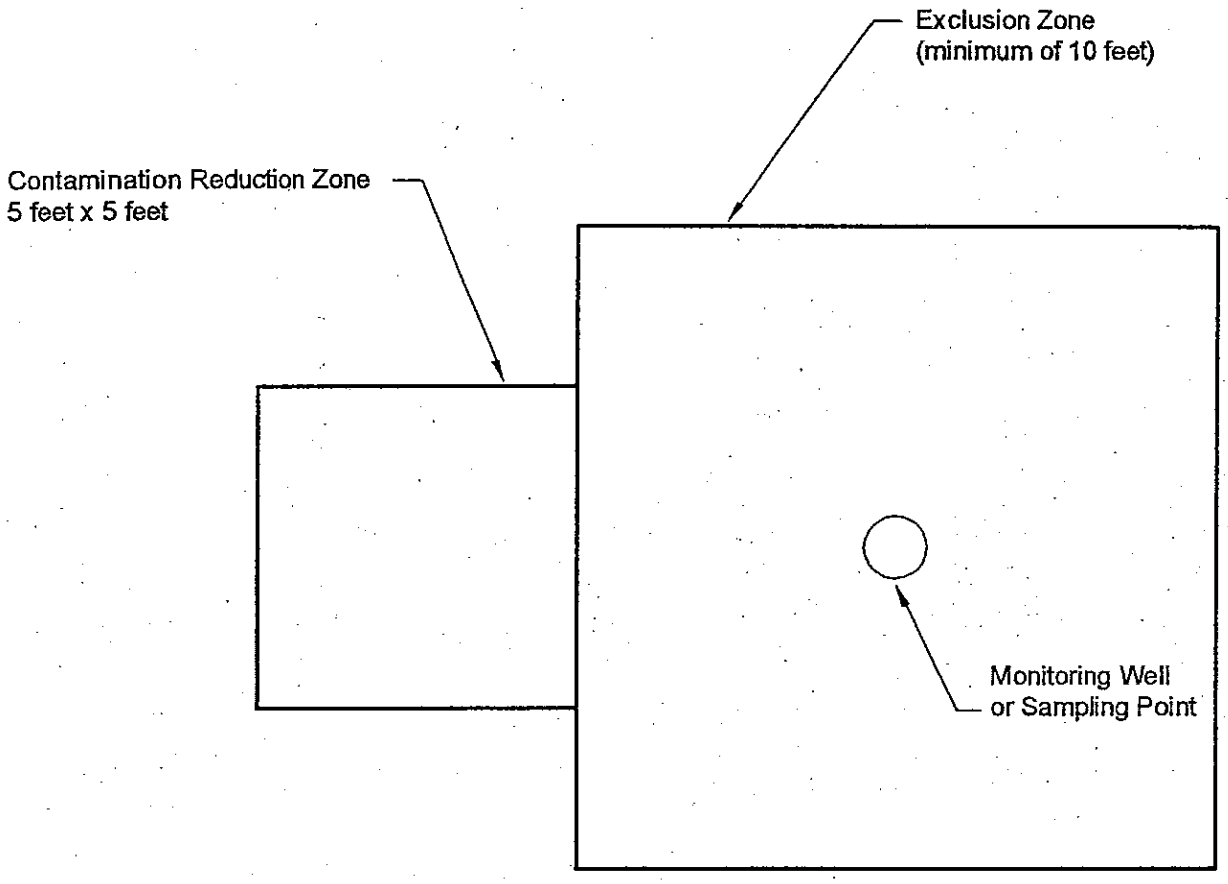
August 7-11, 1989
DATE

Health and Safety
Training Officer

Manager
Environmental Safety & Health

APPENDIX D

REPRESENTATIVE SITE CONTROL ZONES



Legend

3' 0 3'

SCALE: 1" = 3'

Prepared For: USACE
Savannah District

Source: USACE
Job Title: Fire Training
Hunter Army Airfield
Savannah, Georgia

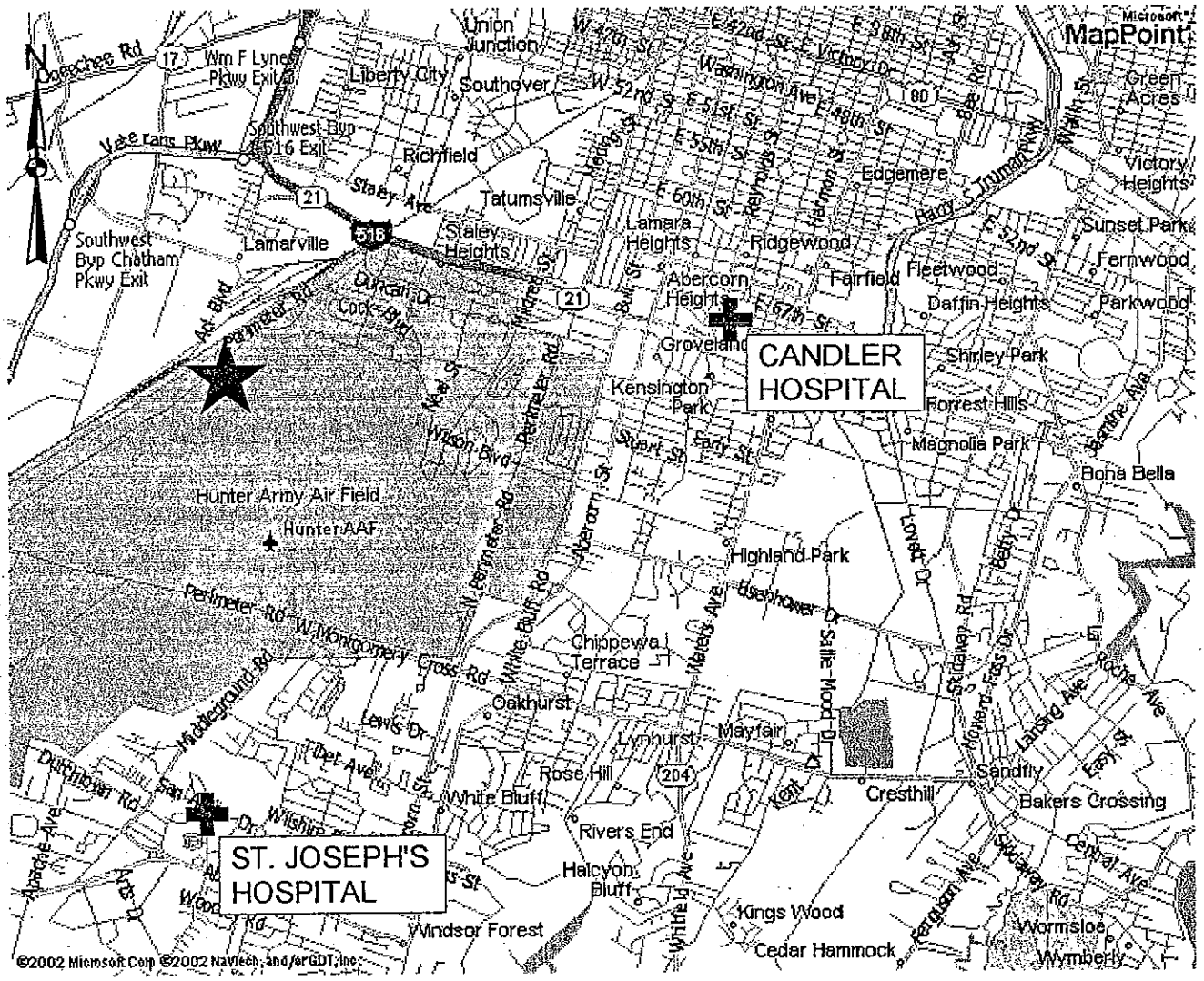
graphics\Fig D-1.dwg(1:1)(08/15/03)

R:\114\114

Figure D-1 Typical Exclusion Zone

APPENDIX E

HOSPITAL LOCATION MAP



St. Joseph's Hospital
11705 Mercy Blvd.
Savannah, GA 31419
(912)925-4100

Directions: to Wilson Blvd., bear right onto White Bluff Rd. turn right onto W. Montomery Cross Rd., left onto Middleground Rd.. then left onto San Anton Dr.

Candler Hospital
5353 Reynolds St.
Savannah, GA 31405
(912)692-6000

Directions: to Wilson Blvd., left onto Wite Bluff Rd. turn right onto SR-21 (W. Renne Ave.) straight. keep right onto SR-21, bear right onto E De Renne Ave.

Fire Training114-113-002 haaf.apr 08/15/03

LEGEND

WORK SITES

HOSPITAL

Prepared By: STEP, Inc.
Oak Ridge, TN
Job Title: Fire Training
Hunter Army Airfield
Savannah, Georgia

Candler Hospital and St. Joseph's Hospital

APPENDIX F

RESUMES

MIKE PALMER, CIH, CHP, CHMM

HEALTH & SAFETY MANAGER

Employment Status: Consultant **

Employer History:

- STEP, Inc. Consultant, 2000-Present
- PSC Safety & Health, 2000-Present
- STEP, Inc., 1992-2000
- Ogden Environmental, 1989-1992
- Rust Engineering Co., 1986-1989
- Chubb Group, 1985-1986
- OSHA, State of Florida, 1983-1985

Education:

- M.S., Public Health & Ind. Hygiene, 1988
- B.S., Industrial Risk Management / Fire Science, 1983

Active Registrations

- *Certified Safety Professional 1987 (#9083);*
- *Certified Industrial Hygienist 1989 (#4519);*
- *Certified Haz. Materials Mgr. 1988 (#2008)*

Signature: _____

*** Mr. Palmer was one of the founding partners of STEP in 1992 and managed our Health and Safety Services Division until 2000. At that time, this Division was spun off as an independent company, but Mr. Palmer and his company continue to provide Health & Safety support to STEP. He has provided regulatory guidance and oversight for the development of all STEP health and safety plans and programs.*

Experience and Qualifications:
Mr. Palmer's regulatory knowledge is extensive, in part due to his past employment as a compliance officer for OSHA and extensive industrial consulting experience. In addition to OSHA requirements, he has served as a regulatory liaison and guided clients through DOT Hazmat, RCRA, CERCLA, and Coast Guard Cleanup (FEMA) requirements. Since 1985, his work has included development and implementation of health and safety plans at hazardous waste sites. He has been responsible for developing PPE and air monitoring programs since 1983.

As manager of STEP's Health & Safety Services Division, Mr. Palmer developed the company's Health & Safety Program that outlines STEP's requirements for training, describes the responsibilities of all members of a project team, and includes detailed Standard Operating Procedures for HTRW remediation projects. These procedures include PPE, confined space entry, respiratory protection, and hazard protection programs. Our H&S Program has been approved by many HTRW remediation clients and has served as a model for plans developed for other companies. In fact, Mr. Palmer has developed PPE and air monitoring programs for over 40 clients at locations throughout the EMAC 2 geographical area.

Mr. Palmer has the responsibility to review and approve all Site Specific Health and Safety Plans prepared by STEP. Over the past four years, over 80 separate Site Specific Plans for HTRW investigation and remediation have been prepared and approved.

Under a contract with the USACE Huntsville District, Mr. Palmer was Principal Instructor for 40-hour HAZWOPER courses conducted at the Huntsville Training Center in Huntsville, AL. He has conducted hundreds of HAZWOPER and other health and safety related training courses for Federal, state, and private sector employees.

AMBROSE J. (JIM) MADAJ, P.G.
HYDROGEOLOGIST / PROJECT MANAGER

Education: University of Oklahoma
B.S., Geology, 1985

Professional Training:
OSHA 40-hour Hazardous Waste Operations Training
OSHA 8-hour Annual Refresher
OSHA 8-hour Confined Space Training
OSHA 8-hour Supervisor Training
OSHA 10-hour Construction Safety and Health

Experience: ***Solutions to Environmental Problems, Inc., Oak Ridge, TN. 1998 to present.***
Project Manager/Senior Hydrogeologist.

Mr. Madaj serves as Project Manager and Technical Advisor for projects at Fort Campbell and Fort Stewart. At STEP, he is responsible for coordination with the USACE – Nashville District and with Fort Campbell environmental personnel to ensure that all projects run smoothly. He is also responsible for allocating resources for simultaneous projects, review of reports to ensure technical accuracy, and ensuring that projects are completed on time and within budget. In addition, he works closely with client representatives and regulators to determine remedial options.

Mr. Madaj specializes in subsurface hydrogeology. During his career, he has installed over 1,000 wells at sites in AL, AR, CA, CO, FL, GA, IL, KS, ME, MI, MO, MS, NC, NM, NY, OK, SC, TN, TX, and WA. These wells have been installed in all types of soil and rock including fractured rock, crystalline rock, carbonate rock, sandy coastal soil, and mountainous areas. In addition, as part of a research study, Mr. Madaj installed temporary wells into coral areas near the Marshall Islands. He has drilled to depths of 1500 feet, and has used a variety of drilling technologies including horizontal and small-diameter wells. Regulatory experience includes a thorough understanding of EPA sampling and drilling guidance, as well as state-specific regulations. Using his knowledge of subsurface hydrogeology, he has managed and provided technical input on projects dealing with shallow and deep petroleum contamination, deep solvent contamination (up to 400 feet below ground surface at a site in California), and shallow pesticide and dioxin contamination.

Using his drilling and sampling expertise, Mr. Madaj has written procedures for these activities, and instructed others in soil, groundwater, sediment, and surface water sampling.

Solutions To Environmental Problems, Inc. (1998 – Present); Oak Ridge, TN
Senior Project Manager

2003; Free Product Recovery at Campbell Army Airfield, Fort Campbell, KY. Project Manager for an ongoing product recovery effort at the Campbell Army Airfield. Directed the installation of a solar-powered product recovery pump, which automatically seeks the oil/water interface. The unit is portable and is used for pockets of groundwater contamination and hard to reach areas. Because groundwater can fluctuate as much as 20 feet at the airfield, the automatically adjusting pump reduces monitoring and maintenance that would be required with fixed pumps.

2002; USACE – Nashville District; Phase 4 RFI at Campbell Army Airfield for Bravo Parking Apron and Solid Waste Management Unit 41; Fort Campbell, KY. Project Manager for an RFI involving the installation of two groundwater monitoring wells at SWMU 41 and the completion of three soil gas surveys at Campbell Army Airfield to delineate the extent of subsurface fuel contamination. Results were used in a human health risk assessment. Responsible for coordinating field activities and review of final reports.

2002; AIMTech; RCRA Facility Investigation at SWMU 27, Open Burn/Open Detonation Unit, Fort Campbell, KY. Project Manager responsible for a RCRA Facility Investigation to determine whether residual contamination from explosives was present at the site. The task included developing and sampling 16 existing wells, and collecting 35 surface soil samples and 21 subsurface samples from 7 Geoprobe borings. Samples were analyzed for VOCs, SVOCs, energetics, sulfites, nitrates/nitrites, and total phosphorous. All field efforts were coordinated with UXO specialists to ensure that all project activities were conducted safely.

2001-2002; USACE – Nashville District; Oil/Water Separator Removal, Ft. Campbell, KY. Project Manager responsible for oversight during removal of 42 oil/water separators. Removal activities included demolition of below ground structures and the associated influent and effluent piping. Pits were overexcavated and confirmatory samples were collected and analyzed for VOCs, SVOCs, RCRA 8 Metals, and PCBs.

2001; USACE – Nashville District; Various Projects Involving Fuel Releases at the Campbell Army Airfield, Fort Campbell, KY. Project Manager responsible for addressing fuel releases to soil and groundwater near Pumphouse 1, Pumphouse 2, and Hangar 3 at the Campbell Army Airfield. Free product recovery at the two pumphouses was performed using vapor extraction and skimmer pumps. Over the first 11 weeks, over 11,000 gallons of fuel were recovered.

2000-2002; AIMTech, UST Investigation, Fort Stewart, GA. Project Manager responsible for oversight to determine the extent of contamination related to UST and heating oil tanks at Fort Stewart. Project activities included installation of groundwater monitoring wells, and soil and groundwater sampling to determine the extent of VOC and PAH contamination.

2000; USACE – Nashville District; Investigation of Oil Pit sites at SWMU 149. Project Manager during investigation of 40 suspected oil pits used for vehicle maintenance fluids. Intrusive investigation activities included verification of the

presence of the oil pits, removal of contaminated soil from two of the sites, installation of groundwater monitoring wells, and soil sampling. Worked with client representatives to determine remedial options.

2000; USACE – Nashville District, Pumphouse 1 Fuel Reconnaissance and Pipeline Repair, Fort Campbell, KY. Project Manager during pipeline repair near Pumphouse 1 at Fort Campbell. During April 2000, tracer testing on the active fuel line near the Pumphouse indicated the presence of a fuel leak. Project activities included excavating to a depth of 8 feet to expose the pipeline in the suspected leak area. Sampling was performed to determine appropriate disposal.

1999-2001; USACE-Nashville District; RFI and Corrective Action– Skeet Range; Fort Campbell, KY. Project Manager for RFI activities to characterize surface soil, sediment, and surface water contamination. Surface soil samples, surface water, and sediment samples were collected and analyzed for TCL PAHs and TAL metals. Responsible for project management, client interface, technical direction and oversight during removal of the top 18 inches of soil from the site.

1999-2000; USACE-Nashville District; Update Generic WP and SAP; Fort Campbell, KY. Project Manager responsible for revision of the Fort Campbell Generic Work Plan and Standard Sampling and Analysis Plan to reflect changes in regulatory requirements and better understanding of site conditions.

1999-2000; USACE-Nashville District; Fort Campbell Pumphouse RFI; Fort Campbell, KY. Project Manager conducting sampling to determine the presence or absence of fuel contamination. Two groundwater wells were installed. Surface and subsurface soil samples were collected and analyzed for TCL VOCs, SVOCs, TAL metals, and TPH and geotechnical parameters. Responsible for project management and technical oversight.

1999-2001; USACE-Nashville District; PX Service Station RFI and CMS; Fort Campbell, KY. Project Manager for a Phase II and III RFIs to delineate the extent of soil and groundwater impact, determine the future movement of contaminants, assess potential risks to human health and the environment, and determine the requirement for corrective actions. Served as technical advisor when drilling activities unexpectedly encountered a large subterranean cave. Responsible for project management, client interface, and technical direction. Provided oversight for the corrective measures study to evaluate and select appropriate remedial methods.

1999; USACE-Nashville District; Fort Campbell 801st Oil Pit Investigation; RFI; Fort Campbell, KY. Project Manager for an RFI at SWMUs 134-137 to determine the presence or absence of groundwater contamination due to past practices at the motor pool. Performed a field investigation, installed 2 monitoring wells, and conducted sampling of soil and groundwater (analyzed for TCL VOCs, TCL SVOCs, PCBs and TAL metals). Responsible for project management, client interface, and technical direction and oversight.

1998-1999; LMES-HAZWRAP; Fort Campbell RFI (Master RFI); Fort Campbell, KY. Project Manager for several RFIs and confirmatory sampling investigations at Fort Campbell ranging from UST removals to complex RFIs that delineate/investigate complex underground fuel distribution systems. Attended

meetings with state and federal regulatory agencies to expedite the review and approval of submitted plans and reports.

Ogden Environmental and Energy Services Company, Inc. (1995 – 1998); and Science and Technology, Inc. (1991-1995); Oak Ridge, TN.
Senior Hydrogeologist.

1991-1998; Lockheed Martin Energy Systems, Inc., Hazardous Waste Remedial Actions Program; Oak Ridge, Tennessee. Provided full-time technical support to HAZWRAP. Assisted in the effort to identify, control, and remediate environmental contamination resulting from past methods of storage, handling, and disposal of hazardous waste at military bases across the country. Prepared statements of work; reviewed business and technical proposals; reviewed work plans and technical reports; interacted with subcontractors, clients, and regulators; provided technical consulting support to the project manager; and provided technical oversight of field work. Ensured quality of all deliverables for CERCLA and UST projects. On several projects, acted as technical lead for the Air National Guards Rapid Response UST Program. Supervised preparation of environmental assessment plans, environmental assessment reports, and corrective action plans. Trained personnel for environmental fieldwork including drill rig supervision and sample collection techniques. DOD facilities included McConnell Air Force Base, Loring Air Force Base, Maine, Columbus Air Force Base, Chanute Air Force Base, Tinker Air Force Base, Mountain Home Air Force Base, Fresno Air Terminal, and New York Air National Guard. Managed Rapid Response Investigation at McGhee Tyson Air National Guard Base in Tennessee. Prepared work plans, sampling and analysis plans, QA plans, health and safety plans, and the final report. Maintained projects within budget and interfaced with clients and regulatory agencies.

NUS Corporation, Tucker Georgia, 1988 – 1991
Project Manager

Planned, conducted, and supervised assignments. Estimated and scheduled work to meet completion dates. Directed assistants, reviewed progress and evaluated results, made changes in methods, and designed equipment. Designed cost-effective approaches to define the extent of contamination at various hazardous waste sites in an accurate manner and for developed feasibility remedial options. Developed site safety plans for all field personnel according to NUS directives as well as OSHA, NIOSH, and other health and safety guidelines. Other duties included project manager, field drilling manager, and sampling field team member on numerous hazardous waste site investigations. Conducted site inspections. Designed and implemented environmental sampling programs. Coordinated field activities and managed sampling teams. Prepared drilling bid specifications and supervised subcontractors in the drilling and installation of groundwater monitoring wells. Prepared site investigation and hydrogeologic reports for EPA. Specific NPL sites included National Southwire Aluminum, Kentucky; Lakeland Tanning, Florida; Zellwood De-listing Project, Florida; Valley Sanitation Landfill, Kentucky; Amnicola Dump, Tennessee; Southwire, Georgia; Beckwith Dump, South Carolina; Ringold Chemical, North Carolina; and Caldwell Systems, North Carolina.

Tinker Air Force Base; Midwest City, Oklahoma. 1987-1988
Hydrogeologist

- Responsible for asbestos surveys and asbestos abatement at multiple sites.

Association of Central Oklahoma Governments (ACOG), Water Resources Division; Oklahoma City, Oklahoma. 1986 – 1987
Hydrogeologist

- Completed water resource studies to determine whether water supply resources were sufficient for surrounding populations.

U.S. Geological Survey (USGS), Water Resources Division. Oklahoma City, Oklahoma. 1982 – 1986
Hydrologic Technician

- Conducted hydrogeologic and surface water studies at sites in Oklahoma and the surrounding states.

Professional Affiliations:

Professional Geologist, Tennessee #0516
Professional Geologist, Alabama #0612
Professional Geologist, Mississippi #624

Awards:

Received the "Award for Individual Excellence, for exceptional individual professionalism, dedication, and loyalty demonstrated in support of the Installation Restoration Program, Fort Campbell, Kentucky during the period of October 1, 2000 through September 30, 2001" presented by the Fort Campbell Environmental Restoration Staff, 6/27/01.

L. BURKE ARTHUR, PROFESSIONAL GEOLOGIST
GEOLOGIST/REMEDIAL MANAGER/SAFETY OFFICER

Education: University of Tennessee, Chattanooga
B.S., Environmental Science (Geology), 1992

Professional Training:
32-hour How To Comply With OSHA Construction Regulations, 1993
Confined Space Entrant/Attendant/Supervisor
DOT General Awareness, 1997
DOT Safety, 1997
DOT Waste Generator
First Aid/CPR
Fort Campbell UXO Training
Hazard Communications Level I
Hoisting and Rigging Inspection Training
Nuclear Criticality Safety Training
OSHA 40-hour Hazardous Waste Operations Training, 1993
OSHA 8-hour Annual Refreshers
OSHA 8-hour Supervisor Training, 1998
Rad Worker II
Risk Assessment and Modeling Training

Burke Arthur's experience includes more than ten years as a Project Geologist providing environmental support for hazardous waste sites from initial site assessments through final remedial action. He has investigated and remediated contaminants such as fuel, solvents, radioactive waste, landfill debris, pesticides, and PCBs.

Mr. Arthur has supervised the installation of hundreds of bedrock wells, overburden wells, soil borings, and extraction wells with depths up to 320 feet below ground surface. He has a thorough knowledge of a variety of drilling and direct-push type technologies including conventional auger rigs, air rotary rigs, geoprobe systems, rotosonic drilling, and core drilling. With experience gained at various military and industrial sites across the southeastern United States, he has installed numerous systems to remediate contamination. He also has experience with hydrogen release compound and oxygen release compound to stimulate natural degradation.

Mr. Arthur's sampling experience includes groundwater, surface water, surface and subsurface soil, hazardous waste, landfill gas (methane) and air. As a geologist, he has supervised the installation of landfill caps, and drainage channels for erosion control. He has also supervised the installation of underground utilities and closure of UST systems at DOE sites. For many projects, Mr. Arthur is responsible for management of all investigation derived waste (IDW) such as soil, purge water,

decontamination water, and personal protective equipment; and he tracks IDW from generation until final disposal. This includes completing manifest documentation and coordinating with site representatives, shipping companies, and waste disposal facilities to ensure proper disposal.

As a Health and Safety Officer, Mr. Arthur is responsible for health and safety oversight on a variety of projects. He has authored or reviewed over 50 site specific health and safety plans, and has completed a variety of safety training courses. He has also been an instructor for excavation/competent person training. He regularly supervises field staff in Level C and B PPE, and is familiar with the use of safety monitoring equipment such as FID/PID, LEL/ O2 meters, colormetric air sampling equipment, particulate air monitoring equipment, and radiation detectors (pancake probes). He conducts initial site entry safety meetings and daily safety briefings, inspects equipment to ensure proper working order, and calibrates and maintains all monitoring equipment.

Experience: ***Solutions To Environmental Problems, Inc., 1992 – Present***
Oak Ridge, Tennessee
Geologist/Safety and Health Specialist/Remedial Manager

2003; UST Removals. Fort Campbell, KY. Project Geologist for the successful removal of three 1,000-gallon waste oil tanks in Kentucky, and one 20,000-gallon JP-8 tank located in Tennessee. Completed Notice of Intent (NOI) documentation to permanently close the tanks. Provided oversight during tank removal and prepared all closure documentation. The metal tanks were sent to a recycling facility. Collected confirmatory samples from the tank pit in accordance with Tennessee and Kentucky UST regulations. Collected samples from the excavated soil, characterized it for disposal, and prepared all soil manifests.

2003; Free Product Recovery, Campbell Army Airfield, KY. Project Geologist responsible for installation of a solar-powered mobile free product recovery system. Also responsible for operation and maintenance of the fixed soil vapor extraction system at Campbell Army Airfield which includes over 20 extraction wells. Work involves operating both the vacuum system and the internal combustion engine, operating the treatment system for effluent water (an oil/water separator and air stripper), monitoring extraction wells for changes in fuel levels, and optimizing recovery as needed.

2002-2003; AIMTech, RFI at SWMU 39, Fort Stewart, GA. Project Manager/Safety Officer responsible for installing 5 groundwater monitoring wells and two vertical profiles to delineate the extent of waste oil and TCE contamination within a motor pool area. Responsible for coordinating the field crew and subcontractors, sampling, drilling oversight, and preparation of project plans and reports.

1999-2001; USACE – Nashville District; PX Service Station RFI, Fort Campbell, Kentucky. Task Manager during Phase II and III RFIs at the PX service station (SWMU 138) to determine the vertical and horizontal extent of petroleum and TCE contamination at the site. Responsible for management of all investigation derived waste, including 10 drums of TCE contaminated soil that was disposed at a hazardous waste landfill at the LWD facility in Calvert City, KY.

2002; USACE – Nashville District, Free Product Recovery at AOC A, Ft. Campbell, KY. Project Manager/ Safety Officer responsible for installation of eight four-inch wells for vacuum extraction, to a depth of 70 feet. Monitored for immediately dangerous to life

and health (IDLH) conditions using a flame ionization detector (FID). Provided drilling oversight. Responsible for management and scheduling of field crew.

2002; USACE – Nashville District. SWMU 166, Ft. Campbell, KY. Task Manager responsible for installing 3 bedrock monitoring wells to delineate extent of groundwater contamination from a former UST pit that contained waste oil. Collected samples for VOC, SVOCs, PCBs, and metals analysis. Authored the work plan, health and safety plan, and final project report.

2002; USACE – Nashville District. AOC D, Ft. Campbell, KY.. Task Manager for an investigation to determine whether fuel contamination was present in the bedrock aquifer at AOC D. Installed three 3 bedrock wells, and collected groundwater samples. Authored the work plan, health and safety plan, and final report.

2002; USACE – Nashville District; Removal of Two USTs., Ft. Campbell, KY. Project Manager/Safety Officer responsible for successfully removing and closing two gasoline USTs (10,000 and 12,000 gallon). Prepared the application for closure in accordance with TN UST guidance, provided oversight during fieldwork, and served as safety officer during tank removal. Collected confirmatory soil samples from excavated tank pits and waste characterization samples from excavated material. Prepared the UST closure report. Coordinated all activities with the regulatory agency and Fort Campbell, and arranged for representatives to be on site during tank removal and confirmatory samples. Tanks were sent to a salvage yard.

2002; USACE – Tulsa; Perchlorate Study; Longhorn Army Ammunition Plant: Karnak, TX. Project Geologist during a study of perchlorate contamination in nine areas of Longhorn Army Ammunition Plant. Conducted wet and dry season sampling of 113 wells (including direct push water samples) and collection of 238 surface and shallow soil samples. Collected pore water samples to monitor movement of perchlorates near surface water streams.

2000-2002; AIMTech, Corrective Action Plan and UST/Heating Oil Tank Investigation for Fort Stewart, GA. Senior geologist / and Safety Officer responsible for the preparation of the Corrective Action Plan-Part A report for the Victory Shoppette site. In addition, investigated former heating oil tanks by installing groundwater wells, and conducting soil sampling. Responsible for preparation of the Master Closure Report. Delineated methane plume at the South Central Landfill.

2001; USACE – Nashville District; Free Product Recovery at Pumphouse 1 and 2, Fort Campbell, KY. Project Geologist responsible for drilling oversight during installation of extraction wells, oversight of extraction subcontractor, and soil and groundwater sampling during free product removal at Campbell Army Airfield.

2001; USACE – Nashville District; Investigation at Hangar 3, the Paint Spray Booth, and CAAF 11 at Fort Campbell, KY. Project Geologist responsible for installation of groundwater monitoring wells, and soil and groundwater sampling.

2001; USACE – Nashville District; Installation and Sampling of AOC A Pumphouse Wells, Fort Campbell, KY. Task Manager responsible for oversight during installation

of 2 groundwater monitoring wells for a RCRA facility investigation. Collected soil and groundwater samples for VOC, SVOC, metals, JP-4, and JP-8 analysis.

2000-2001; USACE – Nashville District; UST Sites – Wickham Avenue; Fort Campbell, KY. Task Manager responsible for oversight during soil sampling, preparation of Kentucky UST ranking forms, preparation of a data summary report, and preparation of a risk assessment.

1999; USACE – Nashville District; AST Removal at the Bulk Fuel Farm, Fort Campbell, KY. Project Geologist responsible for confirmatory soil sampling following removal of three large aboveground tanks serving the Campbell Army Airfield. Responsible for completing all appropriate documentation, and arranging for shipment and disposal of off-spec JP-8 fuel that was inside the tanks to a hazardous waste incinerator at LWD in Calvert City, KY.

1998-2000; AIMTech, Master RFI Project, Fort Campbell, Kentucky. Senior Geologist and field team leader responsible for surface water, sediment, and soil sampling. Provided technical input for the project report, coordinated with client representatives, procured utility clearances, and coordinated sampling events for multiple sites to reduce cost. Received clean closure for AOC C.

1997-1998; Lockheed Martin Energy Systems, Inc., Hazardous Waste Remedial Action Program; Oak Ridge, Tennessee. Site Safety Officer and Geologist for remedial activities at Fort Campbell, Kentucky. For Landfills 7 and 9, graded sites for positive drainage, estimated vegetative cover, extended monitoring wells that were covered during grading, managed field crew, and coordinated activities and schedules of the investigative team. Also coordinated the field efforts for a RCRA facility investigation for three solid waste management units and seven areas of concern. Collected surface and subsurface soil samples, installed monitoring wells, managed wastes, supervised sampling and drilling crews, and coordinated with the analytical laboratory. Responsible for pre-construction site preparation for a new troop medical and dental facility, which was built on an old landfill. Removed landfill debris from the proposed building site and conducted QA/QC sampling to determine if all the debris was removed and whether any contaminants had leached into the soil beneath the landfill.

2001; USACE; Campbell Army Air Field Active Fuel System Integrity Testing; Fort Campbell, Kentucky. Geologist for an integrity test on twelve 50,000 gallon USTs and the associated piping. Soil gas samples were collected from approximately 5500 feet of pipeline and from around the USTs to provide information on potential leaks.

1999; USACE – Nashville District; Subsurface Investigation of Area of Concern D, Fort Campbell, Kentucky. Geologist for a confirmatory sampling project at the Bulk Fuel Tank Farm. This project involved removal of three large ASTs, and over 500 linear feet of underground and aboveground piping. Confirmatory sampling included the collection of soil samples to determine the presence and extent of contamination.

1998-1999; Tennessee Valley Authority; Knoxville, Tennessee. Geologist responsible for placement of a landfill soil cap to provide proper drainage at Land Between the

Lakes. Installed 3 groundwater monitoring wells and conducted quarterly sampling for one year. Sampling efforts resulted in site closure.

1996-1998; United States Bronze and Powders; Maryville, Tennessee. Geologist/ Site Safety Officer responsible for providing on-site supervision of the construction and installation of groundwater monitoring wells and conducting soil sampling during drilling activities as part of Phase II environmental assessment. Classified soils, conducted field screening of soil samples for VOCs, and prepared soil and water samples for laboratory analysis. Provided site supervision during confirmation sampling and sampling of partially buried 55-gallon drum. Conducted air monitoring during drum sampling using an FID. Interpreted analytical data and prepared the report.

1995-1998; Construction and Demolition Services; Knoxville, Tennessee. Geologist responsible for site supervision during the development and construction of the Class IV Ridgeview Landfill. Surveyed site layout, supervised heavy equipment operators and laborers during construction and excavation activities, supervised construction and installation of the groundwater monitoring wells during drilling activities and excavation and construction of a leachate collection system.

1993-1996; Tennessee Valley Authority (TVA); New Johnsonville, Tennessee. Geologist responsible for the investigation of a construction/demolition disposal site. Provided supervision for field activities including drilling and sampling of waste and soil interfaces of the landfill and installation and sampling of groundwater monitoring wells. Provided QA/QC supervision on the sampling, decontamination, and installation procedures. Conducted field survey of the landfill for final closure. Provided QA/QC during closure activities and survey of the final cap.

1995; Geotek Drilling Co., Inc.; Paducah, Kentucky. Site safety and health officer/field geologist during the installation of 25+ shallow monitoring wells at the DOE Paducah Gaseous Diffusion Plant. Implemented project site-specific safety and health plan and conducted personnel exposure monitoring using flame-ionization detectors, multi-gas detectors, and routine radiological frisking inside exclusion and contamination-reduction zones. Ensured the proper utilization of PPE and adherence to standard operating procedures during well drilling, well construction, and installation activities. Recorded soil classification data, performed water sampling, and provided QA/QC during the installation of the monitoring wells. Provided QA/QC during waste sampling procedures.

1995; Allied Technology Group, Inc.; Paducah, Kentucky. PCB sampling technician during an asbestos/PCB removal project at the Paducah Gaseous Diffusion Plant. Conducted PCB clearance sampling of switchgear units and other components following decontamination efforts by the contractor. Performed grid sampling in accordance with EPA sampling protocols, prepared samples for laboratory shipment maintaining stringent chain of custody procedures, interpreted laboratory results, and prepared material disposal documentation.

1994; Geotek Drilling Co., Oak Ridge, Tennessee. Geologist responsible for soil sampling during the closure in place of ten USTs at Oak Ridge National Laboratory.

1993; DOE Construction Contractors, Oak Ridge, Tennessee. Safety and health officer responsible for daily site inspection for the recognition of OSHA non-compliance items and unsafe work conditions or practices. Presented weekly safety meeting topics to construction site workers. Conducted periodic confined space entry/work monitoring for potential immediate danger to life and health (IDLH) atmosphere hazards and served as excavation competent person. Supervised personnel in level B PPE.

1992-1993; U.S. Army Corps of Engineers; Jacksonville, Florida. For the Hurricane Andrew emergency response project, provided comprehensive environmental, safety, and health (ES&H) support services during debris removal and debris reduction activities. Provided comprehensive ES&H support services during debris removal and debris reduction activities. Identified and segregated hazardous and toxic waste (HTW) and monitored disposal site operations. Removed HTW from debris sites, identified sources of environmental insult, conducted air monitoring, and stockpiled HTW into spill-control areas. Monitored all processes associated with the implementation of a respiratory protection program, fire watch program, traffic safety control program, ambient air monitoring program, and burn management/ash handling plan. Supervised personnel in level B PPE.

Professional Affiliations:

Registered Professional Geologist – Tennessee (TN2977)
Registered Geologist since 1992, PG since 1997

APPENDIX G

STEP S&H MANUAL
(Program Attachments)

Personal Protective Equipment
Confined Space Entry
Electrical Safety
Hazardous Communication
Toolbox Safety Meetings

Personal Protective Equipment

15.0 PERSONAL PROTECTIVE EQUIPMENT PROGRAM

15.1 Scope and Application

The PPE Program applies to all workers who will wear PPE as part of the overall injury and illness prevention process. Although engineering controls are generally preferred to PPE, these may not be reasonable, feasible, or practical. PPE use then becomes a necessary and effective control method. The goal is to eliminate exposures through inhalation, ingestion and absorption and to minimize PPE use. PPE is good only if properly selected and used. Improper selection or use can lead to diminished protection and injury. Proper PPE selection and use requires a high degree of personal responsibility. Competent people and training will be provided to assist with proper PPE selection and use. It is everyone's responsibility to properly wear the correct PPE. The STEP PPE Program will be reviewed annually and updated as needed.

15.2 Responsibilities

Responsibilities are defined by individual below.

15.2.1 Corporate H&S Manager

- Provide all materials and equipment required for effective implementation of this program.
- Provide guidance in the selection of appropriate PPE.
- Perform a documented Program Performance Verification of the program at least annually.

15.2.2 Superintendent and Forman

- Evaluate compliance with this program during weekly safety inspections.
- Discuss and document personal protection concerns during safety meetings.
- Ensure that only approved PPE is purchased and used.
- Ensure implementation of the Personal Protective Equipment program.

15.2.3 Employees

- Adhere to all requirements of the PPE Program.
- Inspect all PPE prior to use and obtain new PPE when damaged or defective.

15.2.4 Subcontractors

- Adhere to all requirements of the PPE Program.
- Inspect all PPE prior to use and obtain new PPE when damaged or defective.

15.3 Hazard Assessment

A survey of each work area will be conducted by the site Superintendent and Foreman. The purpose of the survey is to identify all potential hazards associated with the operations/tasks that are present on the jobsite. Once the hazards have been identified, the superintendent will make recommendations regarding PPE needs for the operation. The PPE Hazard Assessment Worksheet is included as an attachment and will be used for assessing each task.

15.4 General PPE Requirements

- Hard hats - shall be worn at all times on site. Hard hats are to be worn with the bill in front, except for welders who are actively welding. All hard hats must meet ANSI Z89.1 and contain labeling satisfying this requirement.
- Safety Glasses - shall be worn at all times when there is a potential exposure to flying projectiles. All safety glasses must meet ANSI Z87.1 and contain labeling satisfying this requirement. Goggles or a face shield over safety glasses are compulsory when drilling, burning, chipping, grinding, gas welding, grouting and where otherwise required by your foreman.
- Foot wear- no sandals, opened toed shoes, tennis shoes or look a likes will be allowed. Only good repairable type work boots or shoes.
- Harness and Lanyards - shall be used when fall potential is six feet or more above the ground. More specific requirements for fall protection PPE is contained within the STEP Fall Protection Program.
- Shirts - with at least 4 inch sleeves are to be worn at all times by all personnel while on a company site. Shorts, tank tops, loose or torn clothing will not be permitted.
- Finger rings and wristwatches - are a constant hazard and all employees are encouraged to remove them while working. No jewelry permitted when performing electrical work.
- Welding hoods - are mandatory for all arc welders and safety spectacles must be worn under the hood.
- Gloves – shall be worn when handling material with sharp or rough edges or as directed by your Supervisor.
- Respiratory Protection – Respirator use is covered under the Respiratory Protection Program.

15.5 Purchasing Of New PPE

When new job tasks or processes require new PPE, only approved equipment may be purchased. Most PPE purchased from safety suppliers is approved for intended use. Refer to specific OSHA and consensus standards (NIOSH, ANSI).

15.6 Employee Information and Training

Employees must receive training initially. Retraining must be conducted when work processes change; types of PPE are changed; or when there is reasonable belief that employees have not retained the requisite understanding of the above requirements. The training should contain the

following content:

- When PPE is necessary;
- What PPE is required;
- How to properly don, doff, adjust and wear PPE;
- Limitations of the PPE; and
- The proper care, maintenance, useful life and disposal of PPE.

15.7 Medical Evaluations

Medical evaluations may be necessary for specific types of PPE (e.g., respirators). The Corporate Safety & Health Manager shall establish which employees are to be included in medical surveillance, as well as the nature of the medical surveillance.

15.8 Program Review and Revision

The Corporate Safety & Health Manager shall perform an annual assessment of this program. The assessment will address the degree and consistency of program element implementation in the workplace. The attached Program Performance Verification criteria will be utilized to conduct and document this assessment.

15.9 Disciplinary Policy

All employees are expected to adhere to the procedures given in this written program. Failure to comply will result in disciplinary action as described in STEP's disciplinary policies.

15.10 Record Keeping

Human Resources shall maintain an accurate record of the following information:

- All employee medical records shall be retained for the duration of the affected employee's employment plus thirty years.
- The most current employee training records.
- Incident Forms will be maintained for five years.

Attachment 15-1 Personal Protective Equipment, Program Performance Verification

Location: _____ Review Date: _____

No.	Program Element	Status	
		Complete (√)	Target Date
1.	The Corporate S&H Manager has been appointed and trained to oversee the administration of this program.		
2.	Is only approved PPE purchased for use?		
3.	Have employees been trained in the use and care of PPE?		
4.	Have hazard assessments been conducted for all job tasks?		
5.	Are visitors supplied with required PPE?		
6.	Is defective PPE removed from service promptly and replaced?		
7.	Are all employees and subcontractors wearing the required minimum PPE?		

Comments:	Reviewer Names:
	_____
	_____
	_____

Attachment 15-2 PPE Hazard Assessment Worksheet

Location: _____ Date: _____
Job Task: _____ Assessor: _____

Check All That Apply				Comments / PPE Required
Hand Protection				**PPE TO BE USED:**
Cuts	☐	Abrasions	☐	
Hot	☐	Cold	☐	
Wet Work	☐	Dry Work	☐	
Chemical	☐	Vibration	☐	
Foot Protection				**PPE TO BE USED:**
Object weight _____ lbs.				
Sharp Objects in area	☐			
Eye Protection/ Face Protection				**PPE TO BE USED:**
Impact Only	☐			Safety glasses with side shields
Chemical Splash	☐			Goggles/Face Shield
Welding, Sparks, Grinding	☐			Safety glasses & face shields
Head Protection				**PPE TO BE USED:**
Possible injury/falling object	☐			
Contact w/ electrical hazards	☐			
Body				**PPE TO BE USED:**
Protective Clothing	☐			
Apron	☐			
Hearing Protection				**PPE TO BE USED:**
Plugs	☐			
Apron	☐			
Respiratory Protection				**PPE TO BE USED:**
Disposable (Dust Mask)	☐			
Cartridge Type and Changeout Frequency:				
Other:				

Confined Space Entry

14.0 CONFINED SPACE ENTRY POLICY

STEP has conducted a review of its operations and spaces and has determined that no STEP employees are to enter permit-required confined spaces. All work involving permit-required confined space entry will be conducted by outside subcontractors using the proper equipment, tools, permits, and appropriately trained personnel (both entrants and attendants) for the task.

OSHA defines a "Confined Space" as a space that has all of the following characteristics:

- large enough and configured so that entry is possible;
- limited means of entry and exit; and
- not designed for continuous occupancy.

A "Permit-Required Confined Space" is a confined space that has at least one of the following characteristics:

- has or could contain a hazardous atmosphere;
- contains material that could engulf an entrant;
- internal configuration that could result in an entrant being trapped; or
- contains any other recognized serious safety or health hazard.

Potential permit-required confined spaces at STEP sites and offices are limited to excavations with suspected subsurface environmental contamination. Contractors are solely responsible for the safety of their employees and compliance with applicable OSHA standards. Written authorization from the STEP Corporate Safety & Health Manager is required prior to all entries into permit-required confined spaces.

STEP also does not have the capability for responding to confined space emergencies. Subcontractors must coordinate emergency rescue planning with local emergency response services.

All STEP employees will be informed of this policy, including potential permit spaces and the requirement for no entry into them.

Electrical Safety

5.0 ELECTRICAL SAFETY PROGRAM AND LOCKOUT/TAGOUT

5.1 Scope and Application

This program is applicable to all employees and contractors of STEP while working on any STEP work site during construction or maintenance.

5.2 References

Title 29 Code of Federal Regulations (CFR) Part 1926.404-.408, .416 - .417
Title 29 Code of Federal Regulations (CFR) Part 1910.303-335

5.3 Definitions

- Qualified Person - an individual who is capable of working safely on energized circuits, and understands proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools. (i.e., licensed electrician or similarly trained).
- Nonqualified Person - an individual not meeting the definition of a qualified person.
- Authorized Employee – A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment.

5.4 Responsibilities

Program responsibilities are defined below for the individuals designated to ensure the proper implementation of this program.

5.4.1 Corporate Safety & Health Manager

- Provide the resources and authority to ensure the program elements are instituted as required.
- Hold all assigned responsible parties accountable as outlined in the written program.
- Periodically inspect project sites for electrical safety hazards and compliance with this program.
- Perform and document a Program Performance Verification (PPV) of the Electrical
- Safety Program at least annually to ensure program elements are being effectively implemented.

5.4.2 Superintendent or Foreman

- Ensure all affected employees under your supervision have received the level of
- electrical safety training necessary to safely perform their job.
- Maintain a file for each qualified person containing documents that are used for confirming their qualifications.
- Require employees to follow the Electrical Safe Work Practices outlined in this program.

- Be knowledgeable of Electrical Safety Program requirements.
- Make routine surveys of the work company to ensure utilization of PPE and safe work practices by employees.
- Ensure that inspection and testing of cord sets, electric tools, all electrical equipment and receptacles is conducted as required.
- Conduct investigations of electrical accidents.

5.4.3 Employees

- Actively participate in the assigned electrical safety, lockout/ tagout, and temporary wiring training sessions and adhere to the safe operating guidelines contained within this program.
- Obey all established requirements outlined in the Electrical Safety Program.
- Use PPE supplied by the company for all work around exposed electrical circuits.
- Utilize all existing engineering controls, work practice controls and administrative controls provided.
- Inform supervision if PPE is lost, damaged or if additional PPE is needed.
- Qualified employees must participate in the annual mandatory training sessions as scheduled.
- Non-qualified employees do not work on exposed electrical circuits unless they have been de-energized in accordance with the Control of Hazardous Energy (Lockout/Tagout) Procedures.

5.5 Work Practices

- All live parts must be de-energized before the employee works on or near them, unless de-energizing introduces additional or increased hazards. If live parts are not de-energized, other safety related work practices shall be used to protect employees who may be exposed to the electrical hazards involved.
- Conductors and parts of electric equipment that have been de-energized but have not been locked out or tagged shall be treated as energized parts.
- All employees must follow the STEP control of hazardous energy (lockout/tagout) procedures when performing work on fixed electrical equipment or circuits. Test equipment will be used to test the circuit elements and electrical parts of equipment to verify that the circuit elements and equipment parts are de-energized.
- Only qualified persons can perform testing work on electric circuits or equipment.
- If a circuit is de-energized by a circuit protective device, manual re-energization of the circuit will not be done until the determination is made that the equipment and circuit can be safely energized.

5.6 Location/Environment

- Employees may not enter any area containing exposed energized parts unless adequate lighting is provided.
- Safety signs or symbols must be used where determined necessary to warn employees

about the electrical hazards that may endanger them.

- Nonconductive barricades must be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to un-insulated energized conductors or circuit parts.

5.7 Work Space

The minimum work spaces around electrical equipment for "qualified" persons to do work are listed in Tables 5-1 and 5-2 below.

Table 5-1 Work Spaces Around Electrical Equipment

Location	600V Nominal or Less	600V to 4160V Nominal
Width in Front	30" wide	30" wide
Front Clearance	36" to 48" (see Table 5-2)	36" to 60"
Headroom	6'3" high	6'6" high
Lighting	Adequate	Adequate
Entrances to Area	One	One – 24" wide, 6'6" high; if control panel >48" wide, must be one entrance each side

Table 5-2 Working Clearances

Nominal voltage to ground	Minimum clear distance for condition (ft)		
	Condition A	Condition B	Condition C
0 - 150	3	3	3
151 - 600	3	3 ½	4
600 - 4160	3	4	5

Conditions (a), (b), and (c), are as follows:

A. Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated by
B. STEP operating at not over 300 volts are not considered live parts.
C. Exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls will be considered as grounded surfaces.
D. Exposed live parts on both sides of the workspace [not guarded as provided in Condition (a)] with the operator between

If access is needed through the rear of the electrical equipment, at least 36 inches horizontally of work room is to be provided.

5.8 Temporary Power at Work site Construction Sites

- All temporary power installations for work site construction sites shall be installed only by qualified electricians.
- Temporary electrical power and lighting installations of 600 volts, nominal, or less may be used only during remodeling, maintenance, repair or demolition of buildings or equipment.
- Temporary electrical power and lighting installations over 600 volts, nominal may only be used during periods of tests, experiments, or emergencies.

5.9 Electrical Boxes and Cabinets

A rubber grommet or clamp must be used around the conductor to protect against damage where they enter cabinets or boxes.

- Knockouts, breaker openings, and other fittings in cabinets and boxes should only be removed if they will be used immediately. All openings not in use will be closed with a plug or cover.
- Covers will be provided for all pull boxes, junction boxes and fittings. If metal covers are used, they will be grounded and kept closed.
- Each out box will have a cover, faceplate, or fixture canopy.
- Covers for boxes carrying over 600 volts, nominal will be marked "HIGH VOLTAGE."

5.10 Disconnect Means

- All disconnects shall have a minimum of 36" clearance in front of the disconnect to allow for easy access.
- Circuit breakers must clearly indicate whether they are in the open (off) or closed (on) position. The up position of the handle for vertical switchboards will be the closed (on) position.
- The disconnect means will plainly indicate whether it is in the open or closed position. The disconnect means is to be installed at a readily accessible location nearest the point of access to the service entrance conductors.
- Single throw knife switches must be installed so that if the switch falls downward, it will fall into its de-energized position (open - "off" position).
- Every electrical apparatus shall have a disconnecting means and be marked with its rating in volts and amperes or volts and watts.
- Every disconnect means shall be clearly labeled to indicate what electrical apparatus it controls.
- Disconnecting mechanisms (circuit breakers, etc.) must be used for the opening, reversing, or closing of circuits under load conditions.

5.11 Flexible Cords

- All flexible cords shall be marked SJ, SJO, SJT, SJTO, S, SO, ST, STO as required by OSHA 29 CFR 1926.

- All flexible cords will be used in conjunction with a GFCI "pigtail" in addition to the GFCI receptacles on the site.
- Flexible cords (extension cords) used with grounding-type equipment must contain an equipment grounding conductor.
- Any flexible cord that may be used in wet areas or exposed to damp, moist or wet conditions must be designed and approved for use in those locations.
- Flexible cords and cables shall not be used as a substitute for the fixed wiring of the structure, run through holes in walls, ceilings, or floors, run through doorways, windows, or similar opening, attached to building surfaces, or concealed behind building walls, ceilings or floors.
- At no time should flexible cords be spliced or taped together.
- Portable cord equipment, plug-connected equipment and flexible cord sets must be visually inspected before use on each shift for external defects and evidence of possible internal damage. These defects shall be reported to the applicable Supervisor or Crew Leader.

5.12 Grounding

- The grounded conductor of a branch circuit must be identified by a continuous white or natural gray color wire.
- The equipment grounding conductor of a branch circuit shall be identified by a continuous green color or a continuous green color with one or more yellow stripes unless the wire is bare.
- The path to ground from circuits, equipment, and enclosures shall:
  - be permanent and continuous,
  - have the capacity to conduct safely any fault current likely to be imposed on it and,
  - have sufficiently low impedance to limit the voltage to ground and to facilitate the operation of the circuit protection devices in the circuit.

5.13 Ground Fault Circuit Interrupter (GFCI)

- Ground Fault Circuit Interrupters (GFCI) shall be installed on all circuit breakers for construction power.
- A GFCI "pigtail" shall be used in conjunction with all flexible cords and cord and plug equipment, in addition to the GFCI receptacles on the site.
- Receptacle type GFCIs may be used on common neutral systems and where receptacles are more than 250 feet from the breaker.
- A GFCI polarity tester shall be used to ensure trip current values and to test the satellite receptacles downstream from the receptacle containing the GFCI.
- GFCIs shall be installed and maintained in accordance with the requirements of the National Electric Code (NEC) current edition. The system shall be tested prior to being put into service. The test results shall be documented and maintained on file in the EH&S Project office.

5.14 Work Near Overhead Power Lines

- Any nonqualified person, vehicle, or mechanical equipment working in an elevated position near overhead power lines must maintain at least a 10 foot clearance (in reference to the closest conductive object near the power line) for voltages to ground of 50 kV or below and an additional 4 inches for every 10 kV over 50 kV
- Any qualified person working in the vicinity of overhead lines must maintain a distance as identified in the Work Space section of this document. Any use of conductive objects within this distance must have an approved insulated handle.
- If work is to be performed on overhead lines closer than the clearance requirements as identified under Work Space, the lines must be de-energized and grounded.

5.15 Lockout/Tagout Procedures

Whenever work on electrical equipment or services is required the electrical power source shall be de-energized, locked and tagged following these steps:

- Affix a Lockout device and tag. Each applicable authorized person and/ or subcontractor will apply his or her own lock and tag.
- Test the equipment using a voltmeter to verify the energy is isolated.
- Perform required work.
- Ensure tools and people are removed and any guards have been replaced.
- Inform Affected Employees of the removal of locks and tags.
- Remove the Lockout/Tagout device(s) and energize the equipment.

5.16 Crew or Personnel Change

Specific instruction shall be utilized during crew or personnel changes to ensure the continuity of lockout/ tagout protection, including provision for the orderly transfer of locks or tags between off-going and on-coming employees, to minimize exposure to hazards from the unexpected energization. At no point during the lockout event shall the equipment or machine be in an unlocked condition.

In situations where a lockout event will be of an extended duration, the Supervisor or Crew Leader may apply a crew lock. This crew lock will be attached to a multi-lock hasp and will remain attached for the entire duration of the lockout event. Another group lockout device that can be used is a group lock box; the crew lock will be secured at the lockout point, and its key will be placed inside a group lock box. Authorized employees will attach their personal locks to the hasp/group box when working on the machine and remove their locks at the conclusion of their shift.

5.17 Tags vs. Locks

- A tag that identifies the person responsible for de-energizing the system will be applied every time a piece of equipment is locked out.
- Tagging without locking for energy control purposes is forbidden without the written

permission of the Regional Health & Safety Manager.

5.18 Materials and Hardware for Lockout/Tagout

- STEP shall furnish all locks, tags, hasps, or other devices for isolating and securing equipment or machines from energy sources. These devices shall be identified and used solely for the purpose of lockout/tagout.
- Each authorized employee is issued his/her own lock and key set. The individual personally issued lock is marked with the employee's name for identification purposes.

5.19 Lockout Devices Requirements

All lockout/tagout devices utilized for protection against unexpected energization or start up of the equipment or machines, or release of stored energy shall meet the following requirements:

- Lockout devices are of durable construction capable of withstanding the environment for the maximum period of time these devices are exposed.
- Lockout devices are standardized within the facility by type and color and may not be used for any other purpose.

5.20 Program Review and Revision

The Regional Health and Safety Manager shall perform an annual assessment of this program. The assessment will address the degree and consistency of program element implementation in the workplace. The attached Program Performance Verification criteria will be utilized to conduct and document this assessment.

5.21 Disciplinary Policy

All employees are expected to adhere to the procedures given in this written program. Failure to comply will result in disciplinary action as described in the companies disciplinary action policies.

5.22 Recordkeeping

STEP shall maintain the following information:

- All employee training records will be maintained by STEP for at least two years from the last training date.

Attachment 5-1 Electrical Safety and Lockout/Tagout, Program Performance Verification

No.	Program Element	Completed √	Target Date
1.	Company has a current, fully developed company specific written Lockout/Tagout Program Approved by the Corporate Safety and Health Manager that incorporates all OSHA mandated elements.		
2.	Company's written lockout/tagout program clearly outlines the roles and responsibilities of all affected functions and individuals.		
3.	Company maintains a current documented listing of all identified "authorized personnel" at this facility who are permitted to perform lockout/tagout related work.		
4.	Company has developed a General Lockout/Tagout Procedure.		
5.	Company maintains an adequate and readily accessible inventory/supply of lockout/tagout hardware (e.g., lockout locks, tags, valve locking mechanisms, chain, cable, blocking material, group lock boxes, multiple locking hasps) to insure safe lockout at all times.		
6.	Company maintains a current inventory of lockout locks denoting who has been assigned such devices.		
7.	Lockout locks (different and distinguishable from other locks used at the company) have been identified to denote ownership.		
8.	Lockout locks are only used for lockout purposes (i.e., not for personal lockers, toolboxes, etc.).		
9.	Company does not permit the use of master keys or locks keyed alike.		
10.	Company has outlined a lock/key control, lost lock, and lock removal policy within its written program.		
11.	Company has established a policy dealing with shift change and group lockout within its written program.		
12.	Company has identified all authorized and affected individuals or groups who require lockout/tagout training.		
13.	Company has developed a documented lockout/tagout training program for all authorized and affected employees.		
14.	Company uses only trained and competent trainers for conducting lockout/tagout training.		
15.	Company conducts documented lockout/tagout training for all authorized and affected personnel on an annual basis.		
16.	New hires and temporary employees receive lockout/tagout awareness level training at the time they start work for the company.		
17.	Company conducts annually, a documented audit of its entire lockout/tagout program (i.e., review written program elements, observing authorized personnel locking out equipment, training conducted, assessing lockout inventory and hardware, etc.).		
18.	Company's written program requires each authorized person to apply their own lock and tag to each energy-isolating source (or authorized group lockbox) and maintain exclusive control of the key(s).		
19.	Company's written lockout/tagout program requires the sharing of lockout/tagout information and requirements		

No.	Program Element	Completed √	Target Date
	with outside contractors working on company.		
20.	Findings (incidents, near misses reported, deficiencies, lessons learned, worker feedback, positive observations, etc.) from documented lockout audits at company are incorporated into annual refresher lock-out/tagout training for authorized and affected persons.		
21.	Company has developed and communicated to all company employees the disciplinary policy for failure to follow established lockout/tagout procedures.		
22.	Company insures that all managers, supervisors, and/or crew leaders who oversee employees who perform authorized lockout/tagout related work attend documented lockout/tagout training.		
23.	Corporate Safety & Health Manager insures that all documentation (written program, training pro-gram/records, audits, ECPs, etc.) is maintained and readily accessible for review.		
24.	Company requires lockout be used for energy isolation, versus tagging alone. Exceptions to this rule must be reviewed and approved by the Regional Health & Safety Manager and a procedure must be established that makes deviations to this policy as safe as locking/tagging out equipment, per OSHA standards. Employees must be trained (documented) on such procedures when established (e.g., troubleshooting energized circuit with a multi-meter by qualified persons, clearing jam-ups).		
25.	The company has trained all applicable qualified employees, and is the documentation maintained adequately?		
26.	Has electrical safety PPE and other equipment (e.g., nonconductive ladders) been purchased?		
27.	Has electrical PPE been tested (frequency and type of inspection) by an outside service and according to requirements?		
28.	Is electrical equipment over 600V in restricted access locations?		
29.	Is adequate clearance provided for electrical equipment?		
30.	Is temporary wiring being used for long-term use?		
31.	Are the general rules for electrical safe work practices followed during electrical maintenance and repair activities?		
32.	Is temporary wiring in good condition?		

Comments:	Reviewer Names:

Hazardous Communication

13.0 HAZARD COMMUNICATION

13.1 Scope and Application

This program applies to all STEP employees who are, or may be exposed to hazardous materials used in the workplace. It also applies to contractors who may be exposed to STEP hazardous materials or bring hazardous materials to STEP sites or facilities.

13.2 Responsibilities

Program responsibilities are defined below for the individuals designated to ensure the proper implementation of this program.

13.2.1 Corporate H&S Manager

- Ensure all management and affected employees are aware of the Hazard Communication Program.
- Coordinate and manage the overall written Hazard Communication Program.
- Advise Management of any program deficiencies noted requiring his/her action or involvement.
- Prepare internal MSDSs as needed.
- Ensure each office's MSDS/Hazardous Material Inventory binders are kept up-to-date and made available to all employees and contractors.
- Prepare example labels and update internal MSDSs as needed.
- Archive MSDSs.
- Ensure a Program Performance Verification of the Hazard Communication Program is performed and documented at least annually.

13.2.2 Human Resources

- Maintain all training documentation.

13.2.3 Superintendent and Foreman

- Ensure all elements of the HazCom Program are effectively communicated and affected employees in their work area comply with the program elements.
- Ensure workers comply with HazCom guidelines and PPE requirements on a daily basis.
- Conduct employee HazCom training or ensure all employees attend scheduled training.
- Ensure all containers of materials in their work area are labeled.
- Provide or schedule affected employees' training.

13.2.4 Employees

- Use engineering controls, work practices, and PPE as required by company procedures

and policies.
- Inform Management of any symptoms of over exposure that may possibly be related to hazardous chemicals.
- Inform Management of any missing labels on containers.
- Actively participate in all hazard communication training.

13.2.5 Contractors

- If requested, provide a copy of MSDSs to the STEP Primary Contact for all hazardous materials brought on to the property prior to them being brought on site.
- Inform their employees of the availability of STEP MSDSs.
- Ensure all subcontractors adhere to the requirements of this program.

13.3 Contractors

STEP's Contractor Safety Program is the primary vehicle for interacting with contractors at the facility, including those involving Hazard Communication. The program as applicable to Hazard Communication is summarized below:

- Prior to the initiation of work, the STEP Primary Contact for a given Contractor (or designee) will conduct and document a facility Pre-Job Safety Briefing that is unique to the work to be accomplished.
- If requested, Contractors are required to provide copies of all MSDSs to the STEP Primary Contact for all hazardous materials brought on to STEP property prior to them being brought on site.
- Contractors are required to relay information on facility hazards to their employees.
- Contractors are required to ensure all subcontractors adhere to the requirements of this program.

13.4 Hazard Determination

Raw Materials and Supplies
STEP does not intend to determine the hazards of materials purchased from suppliers and/or manufacturers, but has chosen to rely upon the evaluation of the materials performed by suppliers and/or manufacturers to satisfy the requirements for hazard determination.

Facility-Produced Materials
In the event STEP must determine the hazards of materials generated at the STEP, the hazard determination will be performed or overseen by the Corporate H&S Manager.

13.5 Hazardous Materials Inventory

A master Hazardous Materials Inventory will be developed and maintained by the Corporate H&S Manager. This list will be updated annually; the most current inventory is included as an attachment.

13.6 Labeling

All containers of hazardous materials must be either being used by the individual that recently (i.e., that shift) transferred the material, or it must be labeled. It is the responsibility of the employee using a material that the label is present.

Materials in Original Containers

If labels on original containers are found to be inadequate, defaced, or otherwise unacceptable, the material will be held until the Regional H&S Manager has determined whether the material will be accepted, and if it will, what label is to be applied.

Secondary Containers/Replacement Labels

All containers that meet the following criteria are considered to be secondary containers:

- not the original container, or the label for the original container is deficient, defaced, or otherwise inadequate; and
- to be used by more than one person on a single shift or by one or more employees over multiple shifts.

All secondary container labels must be completed and the label applied prior to transfer of the material into the container. The Regional H&S Manager will develop example laminated labels for the most common secondary containers in the facility, and will place these examples in the local MSDS books.

If a container has been used previously, the original label must be removed or defaced so that only one hazard label is on the container at one time.

13.7 Material Safety Data Sheets

MSDSs for all hazardous material to which employees are or may potentially be exposed will be obtained and made readily available to all employees. Original MSDSs will be maintained in an office-specific MSDS Binder. MSDSs will be kept current to a maximum date from receipt of five years. The Corporate H&S Manager will be responsible for ordering new MSDSs for existing materials.

Archiving MSDSs

If a material is no longer used or present at the facility, the MSDS will be archived in a location or file designated for that purpose. Typically, these materials are identified during the annual Hazardous Materials Inventory update. The archive date of the MSDS will be marked in ink on the first page of the MSDS, and the archived MSDS will be retained for 30 years.

STEP-Generated MSDSs

If a project must generate an MSDS, the Corporate Safety & Health Manager will generate the MSDS. All internally-produced MSDSs must be updated by the Corporate Safety & Health Manager at least every three years.

13.8 Employee Information and Training

The Superintendent or Foreman will arrange for employee information and training of existing hazardous materials at the time of initial assignment and whenever a new hazardous material is introduced into the work area. Employees will be trained in accordance with the outline in Attachment 13-3.

13.9 Hazards from Non-Routine Tasks

Periodically, employees are required to perform non-routine tasks with hazardous materials. Prior to starting work on such projects, each affected employee will be given information by their superintendent about hazards to which they may be exposed during such an activity. The Corporate Safety & Health Manager may be consulted for a determination of potential hazards if not immediately apparent.

13.10 Program Review and Revision

This program will be reviewed at least annually by the Corporate Safety & Health Manager and will be revised to reflect any changes in procedures or best management practices. The assessment will address the degree and consistency of program element implementation in the workplace. The attached Program Performance Verification (PPV) criteria will be utilized to conduct and document this assessment. The Corporate Safety & Health Manager will be responsible for ensuring the conduct of the review and incorporation of any revisions. The latest PPV will be retained by the Corporate Safety & Health Manager.

13.11 Disciplinary Policy

All employees are expected to adhere to the procedures given in this written program. Failure to comply will result in disciplinary action as described in STEP's disciplinary policies.

13.12 Record Keeping

The individuals or departments listed below shall maintain the following information:

- All employee training records will be maintained by Human Resources at least two years from the last training date.
- All contractor safety information will be retained by the responsible person as stipulated in the Contractor Safety Program.
- The latest Program Performance Review and latest Hazardous Material Inventory will be retained by the Regional H&S Manager.
- Original and archived MSDSs will be maintained by the Corporate H&S Manager.

Attachment 13-1 Hazard Communication, Program Performance Verification

Reviewer Names: _____ Date: _____

_____

_____

Hazard Communication Program	YES	NO
1. Is a written Hazard Communication Program complete and representative of the current organizational structure?		
2. Is the Hazardous Material Inventory maintained and updated at least annually to reflect products currently in use (updated in last 12 months)?		
3. Is there an MSDS for each chemical listed in the Hazardous Material Inventory?		
4. Are employees working with chemicals trained on how to protect themselves, recognize, and react to overexposure or spill?		
5. Is training documented?		
6. Are all secondary use containers labeled in accordance with the written Hazard Communication Program?		
7. Are contractors required to provide information on chemicals they plan to bring to the facility / site prior to doing so?		

Comments:

Attachment 13-2 Hazardous Materials Inventory

Material	How Used	Comments

Page ___ of ___

Attachment 13-3 Employee Information and Training

This training outline specifies the STEP procedure for Superintendents and Foremen to use to provide hazard communication training to the employees assigned to their work teams. To meet the training required by 29 CFR 1910.1200(h), all employees will receive the following information.

1.0 A review of the basic elements and requirements of hazard communication

A review of the company's Hazard Communication Program, including identifying the Corporate H&S Manager. This includes a discussion of the key elements of the OSHA Hazard Communication Standard 29 CFR 1910.1200, including:

- identification of hazardous chemicals used in the facility (or on site) and processes that may produce health or physical hazard exposures to personnel;
- availability of MSDSs for chemicals purchased and used in the facility / site and all processes where exposure to personnel may occur;
- provision of labels, signs, MSDSs, and process instructions to adequately warn of potential or known hazards;
- the training program for all affected employees;
- records retention; and
- periodic program periodic reviews and update procedures.

2.0 Operations or processes where exposures can occur and the hazardous chemicals that are used in the operation/process.

A discussion of each applicable each operation/process, along with a review of the applicable hazards, each hazardous chemicals in use. The Hazardous Material Inventory and appropriate MSDSs for each chemical will be reviewed or referenced. The following information is to be provided to the employees:

- name of hazardous chemicals used in applicable processes;
- controls in effect to limit exposures (e.g., engineering controls, workplace practices, personal protective equipment); and
- means by which the presence or release of hazardous materials can be detected (e.g., spills, industrial hygiene monitoring, direct-treading instruments, smells).

3.0 Location of documents related to hazard communication, including the following:

- Company Hazard Communication Program - Location of the program and the employee's right to review the written program at any time.
- Hazardous Material Inventory – Including the location of the inventory.
- Material Safety Data Sheets (MSDSs) – Including the location and availability for each hazardous material in use. An example MSDS will be reviewed, section by section, and instructions on interpreting the MSDS is to be given. All workers must know where the MSDSs are located and that all MSDSs are available for review as needed.

Toolbox Safety Meetings

7.0 TOOL BOX SAFETY MEETINGS

7.1 Scope and Application

The scope of the Tool Box Safety Meetings is to ensure proper instruction is provided for employees in the recognition and avoidance of unsafe work practices or conditions. Tool Box Safety Meetings will also provide information on the safety regulations and STEP safety program requirements that apply to their work environment. This program is applicable to all STEP employees and subcontractors.

7.2 References

STEP Tool Box Safety Meeting Manual, and OSHA 29 CFR 1926.21.

7.3 Responsibilities

Program responsibilities are defined below for the individuals designated to ensure that Tool Box Safety Meetings are properly conducted and documented.

7.3.1 Corporate Safety & Health Manager

- Ensure all management and affected employees are aware of the requirement to conduct Tool Box Safety Meetings on a weekly basis.
- Provide all materials and hardware for effective presentation and documentation of the Tool Box Safety Meetings and ensure they are properly utilized and maintained.
- Periodically review worksites to ensure meetings are being properly conducted and documented.

7.3.2 Superintendent, Foreman, Project Manager

- Be knowledgeable of Tool Box Safety Meeting requirements.
- Acquire a Tool Box Safety Meeting manual from the Corporate Safety Manager
- Prepare for and present the weekly safety meetings to STEP field crews and subcontractors.
- Ensure safety meetings are properly documented.
- Ensure all affected employees and subcontractors attend weekly safety meetings.

7.3.3 Employees

Employees actively participate in the weekly Tool Box Safety Meetings and adhere to the safety instruction provided.

7.4 Safety Meeting Preparation, Presentation and Documentation

7.4.1 Safety Meeting Preparation

- The Corporate Safety & Health Manager will furnish the STEP Supervisors with a copy of the STEP Tool Box Safety Meeting manual.
- The Tool Box Safety Meeting manual provides fifty-two (52) suggested construction safety topics, which are organized into twelve tabs, corresponding to each month of the year. You are not required to use the suggested topics, but you are required to hold a toolbox meeting each week.
- Preparing for a toolbox safety meeting can be as elaborate or as brief as needed, based on the topic you are presenting. In general, a toolbox safety meeting is defined as a short safety-training meeting with employees, usually on Mondays at the start of the shift.
- After selecting the meeting topic, you should determine if you need any visual aids or other reference material to present the meeting. You may also need to review relevant OSHA standards or STEP Corporate Safety Program documents to supplement the standardized Toolbox Safety meeting material.

7.4.2 Safety Meeting Presentation

- When you conduct the safety meeting, it is best to include only those employees who need the information. For example, for a talk on operating heavy machinery, you would probably only include operators, not everyone on the jobsite. But for a talk about working in areas where heavy equipment is operating, you may include many more workers from the site, perhaps even all of them.
- Introduce each toolbox talks by explaining why you selected the topic, as well as how it applies to them. You need to project your commitment, concern, and interest in the safety program.
- Toolbox safety meetings are also an excellent time to discuss specific jobsite hazards, past accident, and employee safety concerns. After reviewing the topic selected for the week, you will then address the following four topics:
  1. Accident Investigations – Review of any recent accident investigations from any accidents with injuries/illnesses or near misses, which may have happened on this project or similar project environment.
  2. Job Hazards – Review of any site-specific safety hazards identified as part of the site Hazard Assessment or through conduct of site safety inspections.
  3. Old Business – Review of any safety issue or concerns that may have been raised by employees at a previous safety meeting or during the course of the project.
  4. New Business – Open the floor for questions or comments on the main topic, site-specific hazards, or any other safety issues that employees would like to share.

7.4.3 Safety Meeting Documentation

The STEP form for documentation of the Toolbox Safety meeting is included as an attachment to

this program. This form documents the names of the employees who attended, the companies represented, date, location, topic, and provides space to document the site-specific hazard information discussed. The Toolbox Safety meeting form should be completed for each meeting and maintained with other documentation for that project.

7.5 Program Review and Revision

The Corporate Safety & Health Manager shall perform an annual assessment of this program. The assessment will address the adherence to program requirements and the overall effectiveness of the Toolbox Safety meetings. The attached Program Performance Verification criteria will be utilized to conduct and document this assessment.

7.6 Disciplinary Policy

All employees are expected to adhere to the procedures given in this written program. Failure to comply will result in disciplinary action as described in STEP's disciplinary action policies.

7.7 Recordkeeping

All Toolbox Safety meeting records will be maintained in project files for at least two years from the project completion date.

Attachment 7-1 Tool Box Safety Meeting Form

Date: _____	Supervisor/Crew Leader: _____
Topic: _____	Job Location: _____
Accident Investigation Review:	
Job Hazards Review:	
Old Business:	
New Business:	

Print Employee Name	Employee Company

Attachment 7-2 Tool Box Safety Meetings, Program Performance Verification

Reviewer Names: _____

_____

_____

Date: _____

Toolbox Safety Meeting Program	YES	NO
1. Does the Superintendent have a Tool Box Safety Meeting Manual?		
2. Is the Superintendent aware of Tool Box meeting requirements?		
3. Does documentation exist for Tool Box Safety meetings?		
4. Are Tool Box meeting forms being completed properly?		
5. Do interviewed employees reveal that meetings occur?		
6. Do interviewed employees feel that the meetings are effective?		
7. Is site-specific information (Job Hazards, Old Business, etc.) also reviewed?		

Comments: