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# WORK PLAN ADDENDUM NUMBER 2 SOLAR REMEDIATION SYSTEM PILOT STUDY SITE 4 NORTH AVGAS TANK SLUDGE DISPOSAL AREA NAS WHITING FIELD FL

10/1/2000

CH2M HILL

ID 00781

# Work Plan Addendum No. 02
# Solar Remediation System Pilot Study
# Site 4 - North AVGAS Tank Sludge Disposal Area
# Naval Air Station Whiting Field
# Milton, Florida

**Revision No. 02**

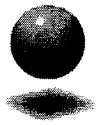
**EPA ID # FL2170023244**

## Contract No. N62467-98-D-0995
## Contract Task Order No. 0011

**Submitted to:**

## U.S. Naval Facilities
## Engineering Command
## Southern Division

**Prepared by:**



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October 2000

# Work Plan Addendum No. 02
# Solar Remediation System Pilot Study
# Site 4 - North AVGAS Tank Sludge Disposal Area

**Naval Air Station Whiting Field**
**Milton, Florida**
**Revision No. 02**

**EPA ID # FL2170023244**

**Contract No. N62467-98-D-0995**
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**Engineering Command**
**Southern Division**

Prepared by:

CH2MHILL
*Constructors, Inc.*

October 2000

**Prepared/Approved By:**

Amy Twitty, P.G., Project Manager — Date 10/27/00

**Approved By:**

R. Scott Newman, Program Manager — Date 11/1/00

**Client Acceptance:**

U.S. Navy Responsible Authority — Date 11/22/00

This Solar Remediation System Pilot Study for Site 4, North AVGAS Tank Sludge Disposal Area, Naval Air Station Whiting Field, Milton, Florida, was prepared under the direction of a Florida registered professional engineer.

Chris Hood, P.E. No. 53927

27 OCT 00

Date

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# Contents, Continued



## Appendices



## Tables



## Figures

# Acronym List

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| µg/L | micrograms per liter |
| AALA | American Association for Laboratory Accreditation |
| ARAR | applicable or relevant and appropriate requirement |
| AASHTO | American Association of State Highway and Transportation Officials |
| ASTM | American Society for Testing and Materials |
| AVGAS | aviation gasoline |
| bls | below land surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Recovery Act |
| C&D | construction and demolition |
| CCI | CH2M HILL Constructors, Inc. |
| CFR | Code of Federal Regulations |
| CMP | Contract Management Plan |
| CO | Contracting Officer |
| CompQAP | Comprehensive Quality Assurance Plan |
| CTO | Contract Task Order |
| DQO | data quality objective |
| FAC | Florida Administrative Code |
| FDEP | Florida Department of Environmental Protection |
| FID | flame ionization detector |
| HSP | Health and Safety Plan |
| LEL | lower explosive limit |
| LDR | Land Disposal Restriction |
| mg/kg | milligrams per kilogram |
| ml | milliliter |
| MSDS | Material Safety Data Sheet |
| NAS | Naval Air Station |
| NAVFAC | Naval Facilities Engineering Command |
| NFESC | Naval Facilities Engineering Service Center |
| NIST | National Institute of Standards and Technology |
| NVLAP | National Voluntary Laboratory Accreditation Program |
| OSHA | Occupational Safety and Health Administration |
| OVA | organic vapor analyzer |
| PCB | polychlorinated biphenyl |
| PID | photoionization detector |
| PPE | personal protective equipment |
| ppm | parts per million |
| PVC | polyvinyl chloride |
| QA | quality assurance |
| QC | quality control |

# Acronym List (Continued)

| | |
|---|---|
| RCRA | Resource Conservation and Recovery Act |
| ROICC | Resident Officer in Charge of Construction |
| SAP | Sampling and Analysis Plan |
| SCTL | soil cleanup target level |
| SHSS | Site Health and Safety Specialist |
| SOW | scope of work |
| SRS | Solar Remediation System |
| SVE | soil vapor extraction |
| SVOC | semi-volatile organic compound |
| T&D | transportation and disposal |
| TAL | target analyte list |
| TAT | turnaround time |
| TCL | target compound list |
| TCLP | toxicity characteristic leaching procedure |
| TRPH | total recoverable petroleum hydrocarbons |
| USACE | United States Army Corps of Engineers |
| USEPA | United States Environmental Protection Agency |
| UST | underground storage tank |
| VOC | volatile organic compound |

# 1.0 Introduction

CH2M HILL Constructors, Inc. (CCI) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (Southern Division, NAVFAC), to prepare this Work Plan Addendum for work to be performed by CCI at Naval Air Station (NAS) Whiting Field in Milton, Florida. The work is being performed under Contract No. N62467-98-D-0995, Contract Task Order (CTO) No. 0011, and in accordance with the management approach outlined in the CCI Contract Management Plan (CMP) dated July 1998.

## 1.1 Plan Organization

This Work Plan Addendum is organized into the following sections and appendices:

**Section 1.0 Introduction** includes a discussion of plan organization, site history, and the objective of planned remedial activities.

**Section 2.0 Execution Plan** provides a description of the tasks to be performed under this CTO, the conceptual design, and the communications plan.

**Section 3.0 Sampling and Analysis Plan** outlines the required testing of environmental media. Specific procedures are included in the NAS Whiting Field Basewide Work Plan (CCI, 1999).

**Section 4.0 Environmental Protection Plan** addresses measures to be implemented to protect the environment.

**Section 5.0 Waste Management Plan** addresses the management and disposal or recycling of wastes generated during the execution of this CTO activity.

**Section 6.0 Quality Control Plan** includes the site-specific project organization chart and describes quality control (QC) testing requirements.

**Section 7.0 Works Cited** lists documents referenced in this Work Plan Addendum.

The following support documents are presented as appendices to this Work Plan Addendum:

- Appendix A Health and Safety Plan
- Appendix B Project Schedule
- Appendix C Submittal Register
- Appendix D Remedial Investigation Reference Drawings

## 1.2 Site Background

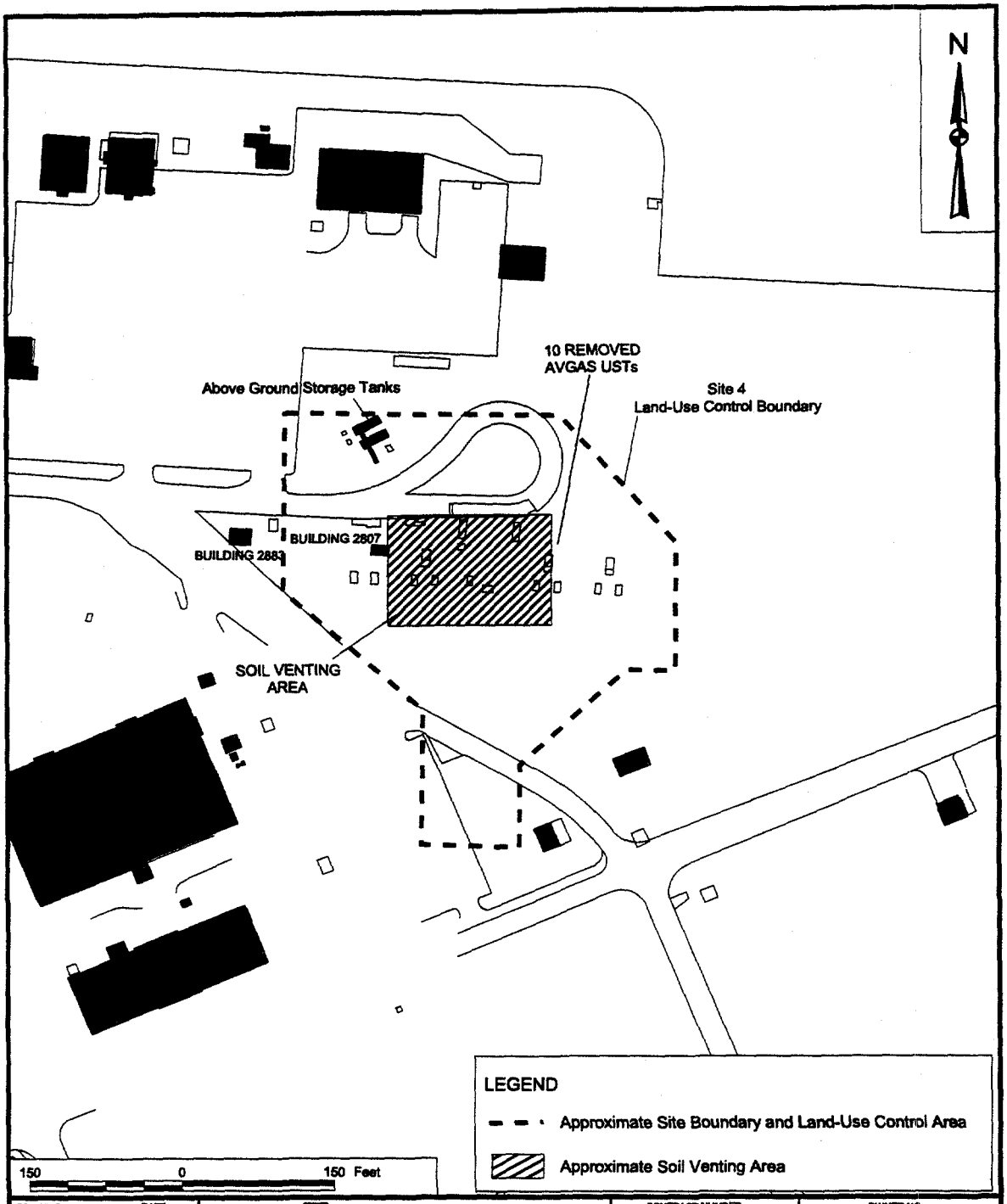
Site 4 is a former underground storage tank (UST) facility located north of Tow Lane at North Field (Figure 1-1). The former tank farm covers approximately 2.5 acres and is currently covered with grass as described in the Remedial Investigation Report for Surface and Subsurface soil Sites 3, 4, 6, 30, 32, and 33 (Tetra Tech, 1999).

Site 4 contained eight 23,700-gallon steel USTs, one 15,000-gallon UST, and one 750-gallon UST dating back to 1943 when NAS Whiting Field first began operations (Tetra Tech 1999). Nine USTs at this site were used to store aviation gasoline (AVGAS) and one UST was used to store contaminated jet fuel. All USTs and associated piping were removed in the mid-1990s. There are no records of spills or leaks at Site 4, but petroleum contamination was observed when the USTs were removed (Tetra Tech 1999).

## 1.3 Remedial Action and Objective

Bechtel Technology & Consulting (Bechtel) has developed solar-powered technology that incorporates an advanced design powered by a photovoltaic system using solar energy to drive a high-efficiency blower for bioventing or limited soil vapor extraction (SVE) as described in Bechtel's Solar Remediation System – The Clean Alternative brochure (Bechtel, 1999).

The objective of the remedial activities being performed by CCI under this CTO is to determine the effectiveness of Bechtel's Solar Remediation System (SRS) in decreasing the concentrations of volatile and semi-volatile organic compounds (VOCs and SVOCs) in the subsurface soil at Site 4. The pilot system will run for approximately one year.




| | | | |
|---|---|---|---|
| DRAWN BY: J. BELLONE | DATE: 5/24/00 | Tetra Tech NUS, Inc. | CONTRACT NUMBER: — / OWNER NO.: — |
| CHECKED BY: — | DATE: — | SITE 4<br>SOIL VENTING AREA<br>NAS WHITING FIELD, MILTON, FLORIDA | APPROVED BY: — / DATE: — |
| COST/SCHEDULE-AREA | | | APPROVED BY: — / DATE: — |
| SCALE: AS NOTED | | | DRAWING NO.: FIGURE 1-1 / REV: 0 |

P:\GIS\NAS_WHITING_FIELD\CH2M_FIGURES.APR\REMEDY PLAN - SITE 4 LAYOUT A JCB 6/6/00

# 2.0 Project Execution

The alternative treatment for the contaminated soil as outlined in the Feasibility Study is in situ soil venting/bioventing using SRS (Tetra Tech NUS, 1999). The proposed area of treatment is approximately 110 by 160 feet (Figure 1-1). Since the radius of influence of the SRS units is not well documented, the pilot study will concentrate on treating the highest contaminated portion of this area on the western edge. Based on the results of the pilot study, SRS may be used throughout the treatment area.

SVE applies a vacuum through extraction wells to draw soil gas from the unsaturated contaminated soil. Pressure gradients within the unsaturated zone induce airflow throughout the porous soil matrix at a rate determined by the soil properties. As the contaminated soil gas is removed, clean air from the surface is drawn into the contaminated zone and the organic compounds are volatilized (Bechtel, 1999).

Bioventing is an in situ technology using microorganisms to degrade organic constituents adsorbed to soils in the unsaturated zone. Because the microbes depend on the availability of oxygen to aid in their consumption of organics, an oxygen source needs to be introduced to the soil matrix. The production activity of the indigenous bacteria is enhanced by introducing airflow into the unsaturated zone through extraction or injection wells (Bechtel, 1999). This pilot study will include both SVE (pull) and bioventing (push) technologies for soil remediation.

This section describes the activities and processes required to complete the pilot study evaluation of the SRS; and outlines field requirements, pilot test methodology, and data requirements to evaluate and meet the pilot study objectives.

## 2.1 Site Preparation

Site preparation tasks will consist of logistical issues associated with the implementation of the pilot study. These tasks will include coordination with NAS Whiting Field personnel on the location of utilities in the area, designation of a laydown area for equipment and materials, and site-specific security and safety concerns. Discussions on the site sampling, site-specific data requirements, and monitoring operations will be coordinated with NAS Whiting Field and Southern Division NAVFAC personnel.

## 2.2 Baseline Sampling

Prior to the evaluation of the SRS units, baseline sampling will be performed to determine the pretreatment conditions at the site. Three types of data will be collected:

- Physical Lithologic Data
- Contaminant Concentration Data
- Site Meteorological Data

A total of 15 sample locations will be selected based on the lithologic data collected during the installation of the extraction/injection wells and the monitoring points. Three soil samples will be collected from the multiple depth intervals (shallow, intermediate, and deep) from three macro-scale monitoring points, and three soil samples will be collected from three of the micro-scale monitoring points (shallow, intermediate, and deep). The macro-scale monitoring points will be used to determine the overall effectiveness of the system in the horizontal direction. The micro-scale monitoring points will be used to determine the vertical distribution of flow, pressure, and oxygen near the extraction/injection wells. In the horizontal direction, the samples will vary in distance from the SRS units (5, 10, 20, and 30 feet). In addition to locations within the treatment zone of the system, one background location will be established prior to the initiation of the baseline sampling program. This location will be within the contaminated soil zone and will be used to evaluate the impact of natural attenuation at the site. Three soil samples will be collected from the background boring location at depths corresponding to the screened intervals of the treatments wells (i.e., 22, 43, and 72 feet bls).

The physical data will include information on the soil type, bulk soil density, grain size, and porosity. From these data, a site-specific geologic cross-section will be generated. Contaminant data will include soil gas (methane, hydrogen sulfide, lower explosive limit [LEL], oxygen, and carbon dioxide), analytical soil concentration (benzene, toluene, ethylbenzene, and total xylenes [BTEX], polycyclic aromatic hydrocarbons [PAHs], total recoverable petroleum hydrocarbons [TRPH], and total organic carbon [TOC]), and organic vapor analyzer (OVA) field measurements. The soil gas will be measured after well installation (prior to startup) and then continuously with data loggers to determine soil respiration. OVA readings will be collected every 5 feet during well installation activities. Barometric pressure and rainfall will be collected to evaluate the meteorological conditions at the site.

To evaluate the impact of the SRS on the soil contamination, samples will be collected from the 15 sample locations on four separate occasions (prior to system startup, and after four, eight, and 12 months of system operation).

## 2.3 Pilot Study Wells and Subsurface Monitoring Points

As part of the pilot study, five vapor extraction/injection wells and nine sets of monitoring points will be installed at Site 4. SRS units will be installed at each of the extraction/injection wells during the pilot study. These five wells will be installed to three different depths. Multi-completion monitoring points will be installed between the extraction/injection wells to monitor the pressure and soil gas in the area during the pilot study.

### 2.3.1 Extraction/Injection Wells

A total of five extraction/injection wells are proposed for the pilot study. Figure 2-1 shows the location of the extraction/injection wells (as indicated along cross sections B-B' and C-C'). Each well will be screened at three depths (shallow, intermediate, and deep) and screens will be separated by a packer. The packer is a device designed to seal off the annular space between the drop tube and the well casing. The packers will be placed above and below each screened interval. The depths of the extraction/injection wells are based on the site lithology and vertical contaminant distribution. Figure 2-2 shows the site cross-section

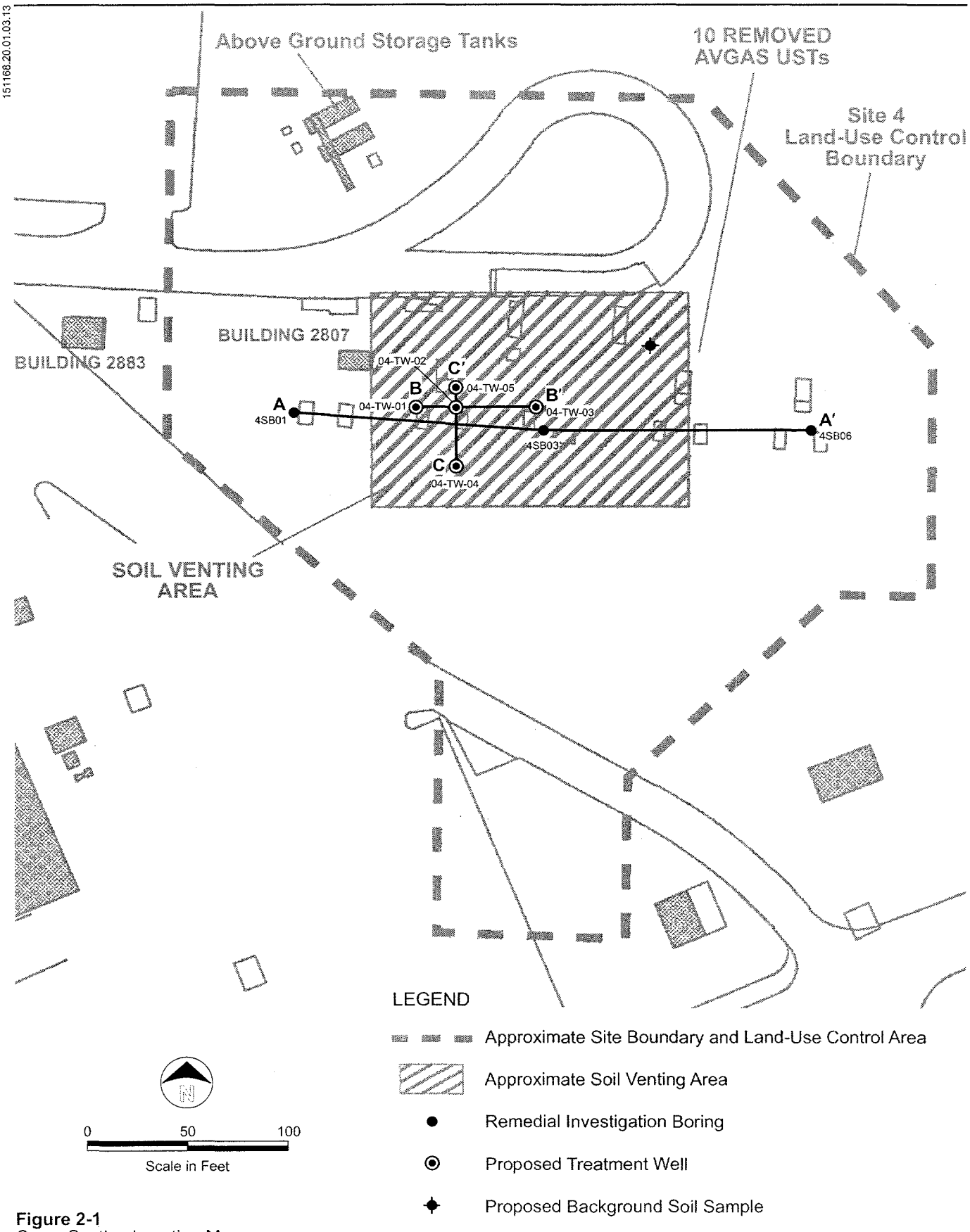



**Figure 2-1**
Cross Section Location Map
*Site 4, NAS Whiting Field*

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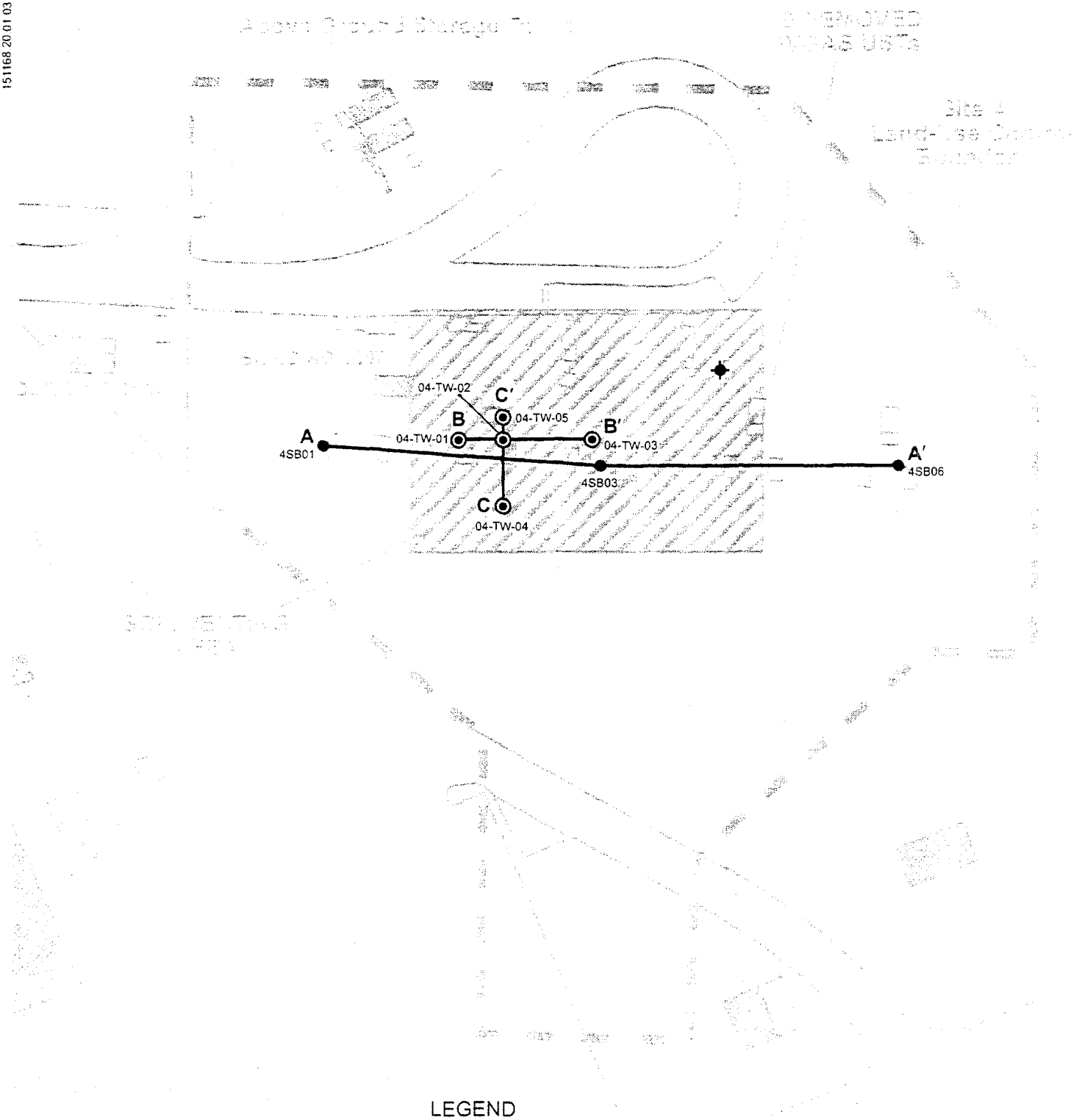


LEGEND

- Approximate Site Boundary and Land-Use Control Area
- Approximate Soil Venting Area
- ● Remedial Investigation Boring
- ◉ Proposed Treatment Well
- ✦ Proposed Background Soil Sample

0 50 100

Scale in Feet

**Figure 2-1**
Cross Section Location Map
*Site 4, NAS Whiting Field*

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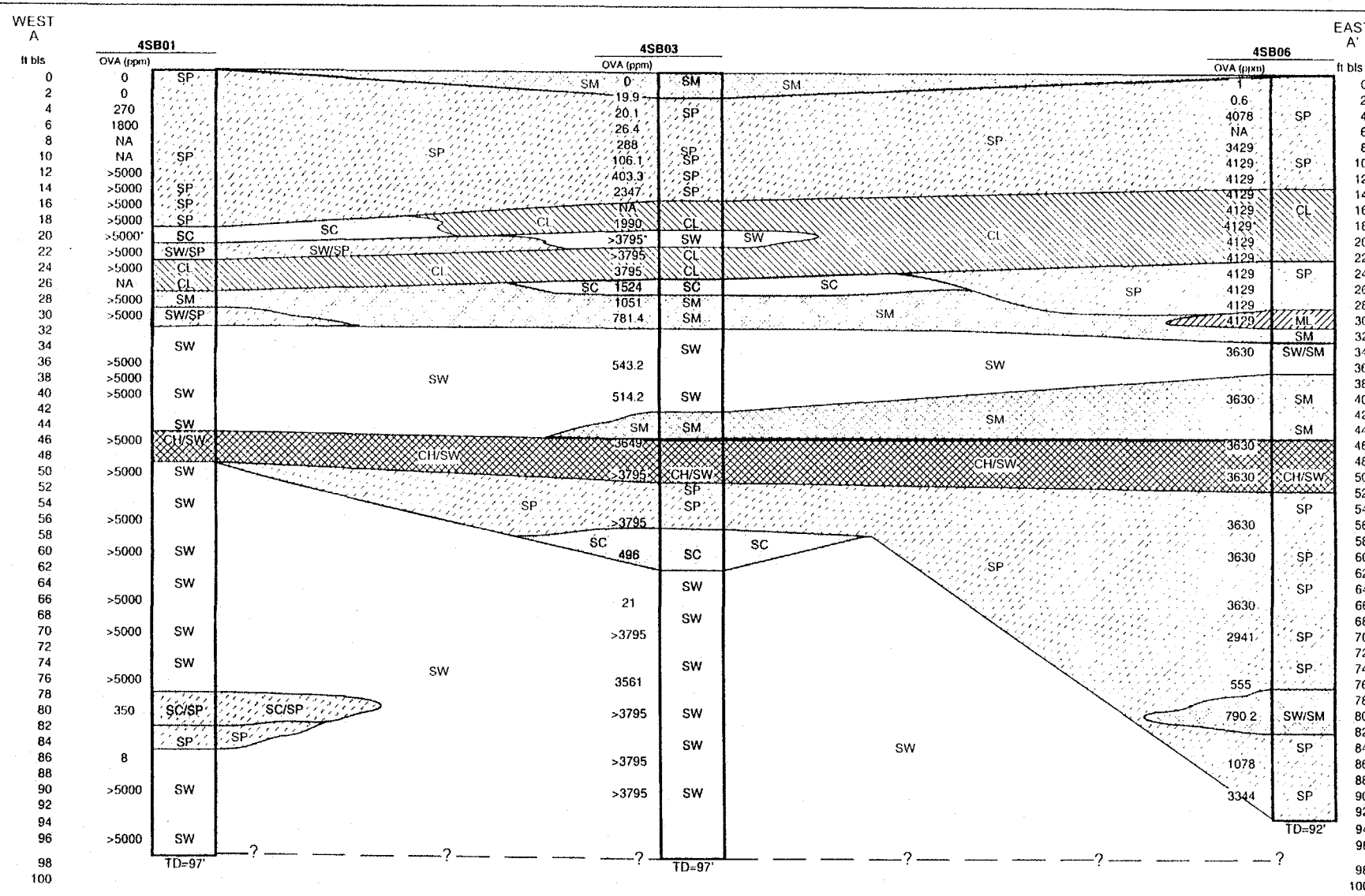


**Figure 2-2**
Site-Specific Geologic Cross Section
*Site 4, NAS Whiting Field*

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available with soil type information and the corresponding available OVA readings. Extraction/injection wells will be designed based on typical bioventing and soil vapor extraction well designs. All of the extraction/injection wells will be constructed using 6-inch, flush-threaded Schedule 40 PVC well casing. Ten to fifteen feet of 0.125-inch screen will be used in the construction of the extraction/injection wells.

As shown on the geologic cross-section (Figure 2-2), clay units exist between the screened intervals for the shallow, intermediate, and deep wells. Although there is significant impact to soil below these units, they may act as semi-confining layers. The approximate vertical location for the screened intervals is shown on Figures 2-3 and 2-4, and included in Table 2-1. The actual screened intervals for the extraction/injection wells will be based on split-spoon samples collected during the advancement of the hollow stem auger boreholes. Each split-spoon sampler will be 2 feet long. Estimated screened intervals are 12 to 22 feet below land surface (bls), 28 to 43 feet bls, and 57 to 72 feet bls. Based on the boring logs from the Remedial Investigation report, there appears to be a perched water table at 72 feet bls. A geologist will characterize each split-spoon sample for soil type and collect headspace readings. Headspace concentrations will be measured every 5 feet using an OVA that is capable of measurements up to 10,000 parts per million (ppm).

**TABLE 2-1**
Extraction/Injection Well Information

| Extraction/Injection Wells | Total Depth (feet bls) | Screened Intervals |
|---|---|---|
| 04-TW-01 | 72 | 12 to 22, 28 to 43, 57 to 72 |
| 04-TW-02 | 72 | 12 to 22, 28 to 43, 57 to 72 |
| 04-TW-03 | 72 | 12 to 22, 28 to 43, 57 to 72 |
| 04-TW-04 | 72 | 12 to 22, 28 to 43, 57 to 72 |
| 04-TW-05 | 72 | 12 to 22, 28 to 43, 57 to 72 |

## 2.3.2 Subsurface Multi-Completion Monitoring Points

Due to the uncertainty in the influence of the SRS operating in the extraction and injection modes, two types of multi-completion monitoring points are proposed for the pilot study. The first type of multi-completion monitoring points will be used to determine the vertical distribution of flow, pressure, and oxygen near the extraction/injection wells (micro scale analysis). The second type of multi-completion monitoring points will be used to determine the overall effectiveness pilot study objective (macro scale). Data loggers will be installed in each of the monitoring points to measure and record oxygen and pressure readings. Figures 2-3 and 2-4 present the SRS wells and monitoring point locations in cross-section (east-west and north-south, respectively) and Figure 2-5 shows the locations in plan view.

### Micro-Scale Analysis Monitoring Points

Three sets of multi-completion micro-scale monitoring points will be installed at the site (Table 2-2). The boreholes will be advanced 5 feet north of the central extraction/injection

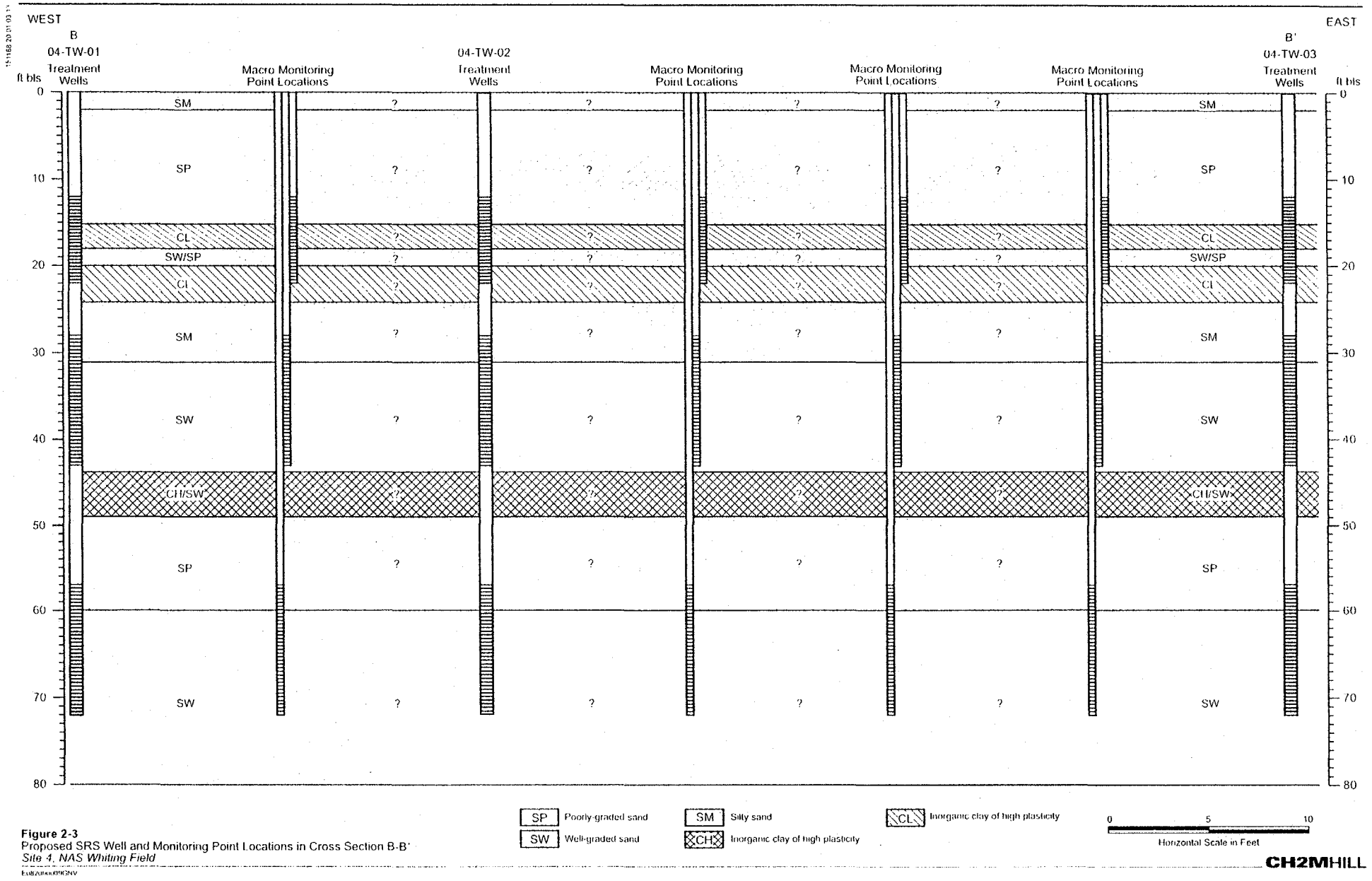


**Figure 2-3**
Proposed SRS Well and Monitoring Point Locations in Cross Section B-B'
*Site 4, NAS Whiting Field*

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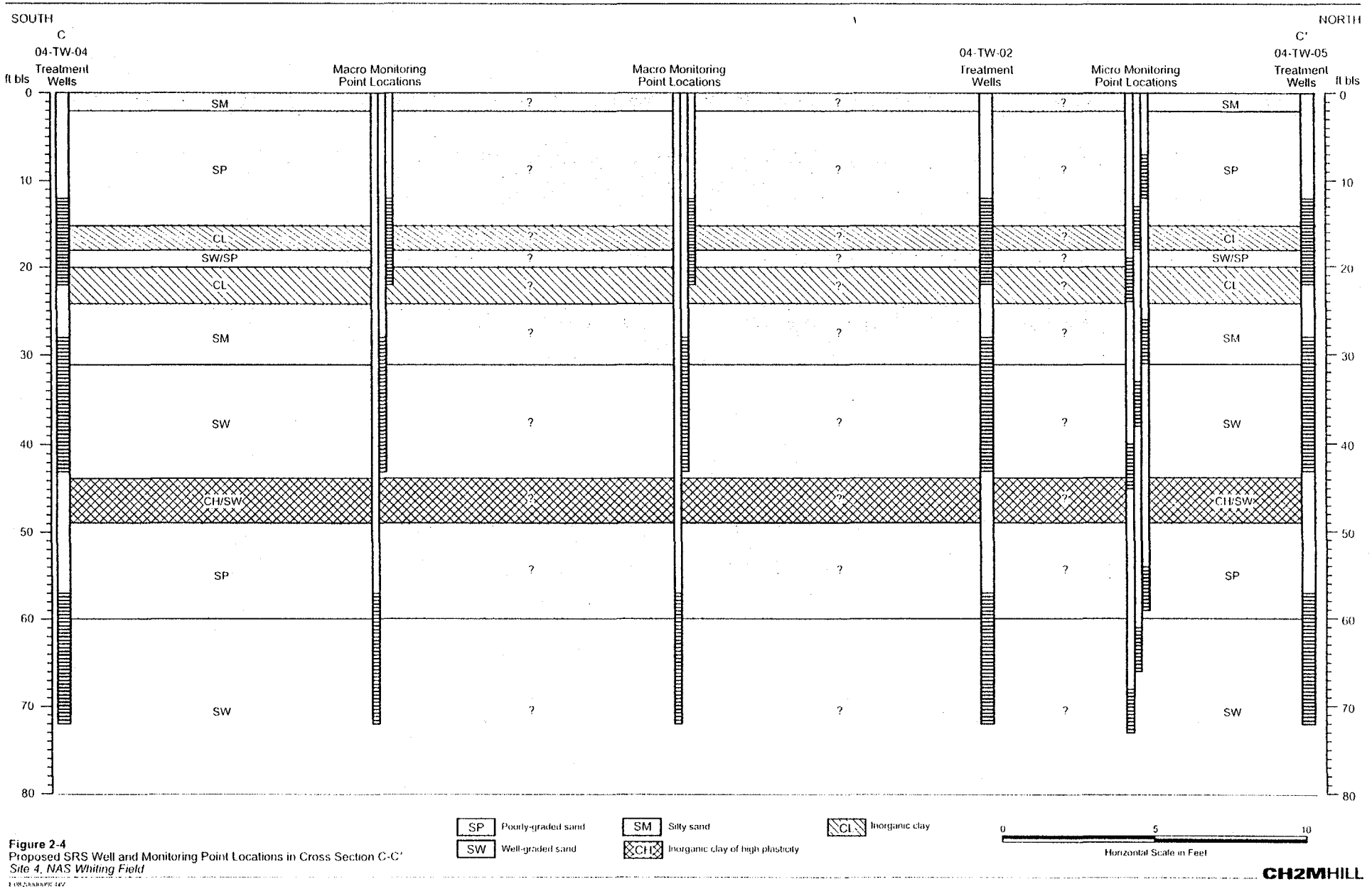


**Figure 2-4**
Proposed SRS Well and Monitoring Point Locations in Cross Section C-C'
*Site 4, NAS Whiting Field*

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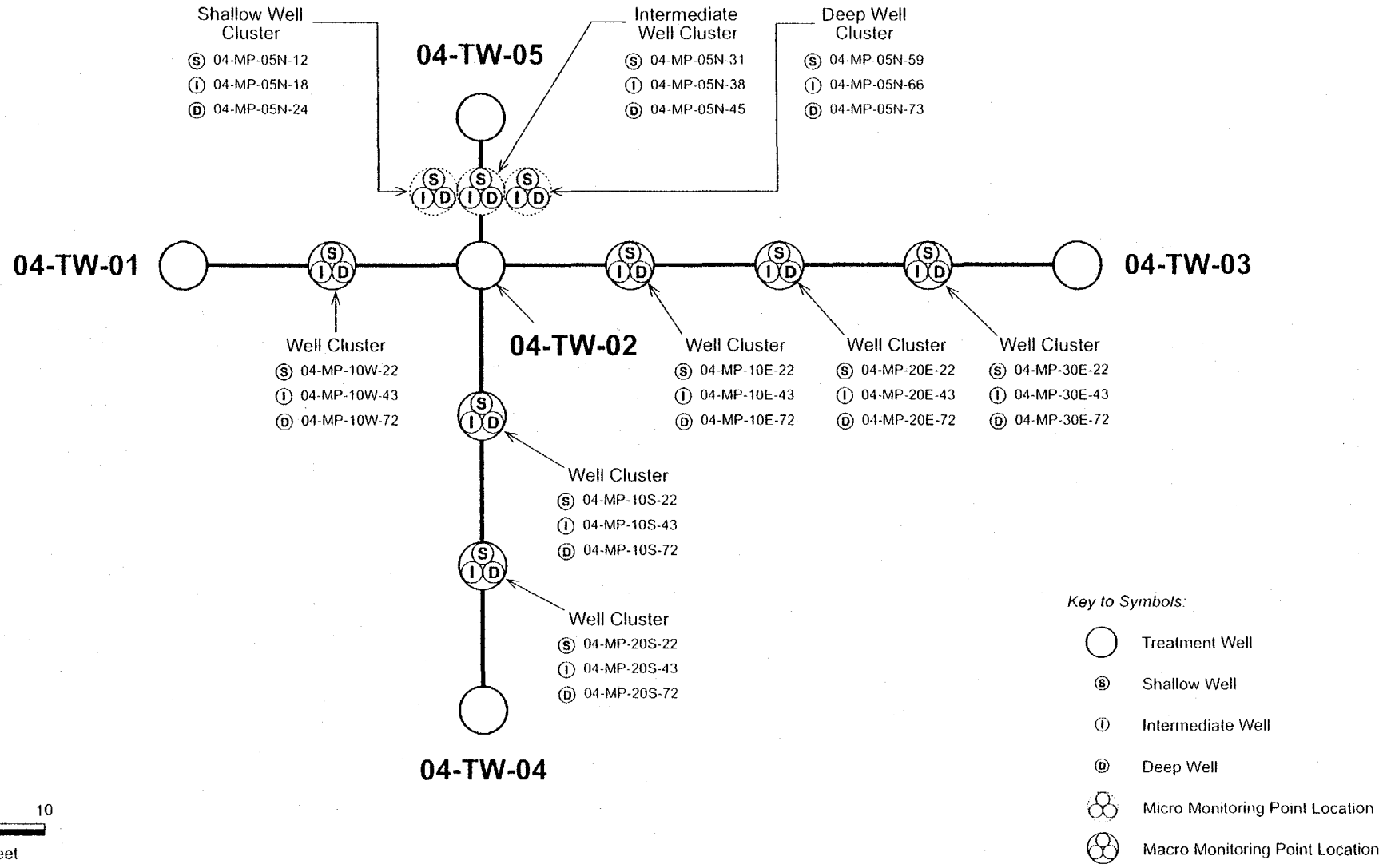


**Figure 2-5**
Proposed SRS Well and Monitoring Point Locations in Plan View
*Site 4, NAS Whiting Field*

well (04-TW-02). The monitoring points are shown on Figures 2-4 and 2-5. These wells will be constructed of 2-inch, Schedule 40 flush-threaded well casing completed with 5 feet of 0.125-inch slotted screen. The purpose of the micro-scale monitoring points is to evaluate the vertical flow within the extraction/injection well screen interval. The three monitoring points for each interval will be installed in a single borehole with a 1- to 2-foot bentonite seal between screened intervals. Prior to system startup, and after four, eight, and 12 months of system operation, soil samples will be collected from three of the micro-scale monitoring point boreholes.

**TABLE 2-2**
Micro-Scale Monitoring Point Information

| Monitoring Point | Depth (bls) | Screened Interval |
|---|---|---|
| **Shallow** | | |
| 04-MP-05N-12 | 12 | 7 to 12 |
| 04-MP-05N-18* | 18 | 13 to 18 |
| 04-MP-05N-24 | 24 | 19 to 24 |
| **Intermediate** | | |
| 04-MP-05N-31 | 31 | 26 to 31 |
| 04-MP-05N-38* | 38 | 33 to 38 |
| 04-MP-05N-45 | 45 | 40 to 45 |
| **Deep** | | |
| 04-MP-05N-59 | 59 | 54 to 59 |
| 04-MP-05N-66* | 66 | 61 to 66 |
| 04-MP-05N-73 | 73 | 68 to 73 |

Note: Final number in well nomenclature denotes total well depth and is subject to change based on site conditions.

*Indicates soil samples will be collected at this location.

## Macro-Scale Analysis Monitoring Points

Six sets of multi-completion macro-scale monitoring points will also be installed at the site (Table 2-3). These boreholes will be installed at 10-foot intervals between the central and perimeter extraction/injection wells. The monitoring points are shown on Figures 2-3, 2-4, and 2-5. The vertical position of the macro-scale monitoring points allows for comparison of the multiple zones of influence in the three depth intervals.

The macro-scale monitoring points will be constructed of 2-inch, Schedule 40 flush-threaded well casing completed with 0.125-inch slotted screen. The monitoring points will be screened at the same interval as the extraction/injection wells (shallow, intermediate, and deep). Three macro-scale monitoring points will be installed in a single borehole. Bentonite seals will be placed between each screened interval. Prior to system startup, and after four, eight, and 12 months of system operation, soil samples will be collected from three different depths (shallow, intermediate, and deep) from three of the macro-scale monitoring points as indicated in Table 2-3.

TABLE 2-3
Macro-Scale Monitoring Point Information

| Monitoring Point | Depth (bls) | Screened Interval |
|---|---|---|
| **Shallow** | | |
| 04-MP-10W-22* | 22 | 12 to 22 |
| 04-MP-10S-22 | | |
| 04-MP-20S-22* | | |
| 04-MP-10E-22 | | |
| 04-MP-20E-22 | | |
| 04-MP-30E-22* | | |
| **Intermediate** | | |
| 04-MP-10W-43* | 43 | 28 to 43 |
| 04-MP-10S-43 | | |
| 04-MP-20S-43* | | |
| 04-MP-10E-43 | | |
| 04-MP-20E-43 | | |
| 04-MP-30E-43* | | |
| **Deep** | | |
| 04-MP-10W-72* | 72 | 57 to 72 |
| 04-MP-10S-72 | | |
| 04-MP-20S-72* | | |
| 04-MP-10E-72 | | |
| 04-MP-20E-72 | | |
| 04-MP-30E-72* | | |

Note: Final number in monitoring point nomenclature denotes total depth and is subject to change based on site conditions.

* Indicates soil samples will be collected at this location.

## Field Measurements and Subsurface Soil Sampling

As previously stated, during the installation of the monitoring points, field measurements, physical parameters, and analytical parameters will be collected. A 3-inch-diameter, 2-foot-long, stainless steel split-spoon sampler will be used to collect soil samples to allow for an adequate volume of soil to be collected for analysis. Soil samples will be evaluated for lithology and OVA readings in the field. Physical parameters will include bulk density, grain-size, and porosity. Soil samples for these physical parameters will be collected in Shelby tubes. Analytical parameters for the soil samples will include BTEX, PAHs, TRPH, and TOC by U.S. Environmental Protection Agency (EPA) Methods 8021B, 8310, Florida

8310, Florida Petroleum Residual Organics (FL-PRO), and 9060, respectively. This information is summarized in Section 3.0.

## 2.4 Pilot System

### Field Measurements and Subsurface Sampling

The pilot test will include four primary evaluations. The first test will evaluate and document the performance of the system prior to attaching the SRS equipment to the extraction/injection wells. The second test will evaluate the performance of the systems in the pull only mode of operation (SVE). The third test will focus the evaluation of the push mode of operations (bioventing). A combined test of the SVE and bioventing modes of operation will be conducted as the final test.

### 2.4.1 System Installation

Five SRS units are proposed to conduct the pilot test. Once the SRS equipment arrives on site, the systems will be tested to determine baseline flow and pressure capabilities. This process will allow for the general field parameters to be evaluated and the testing of the support and monitoring equipment. After testing each SRS, the equipment will be connected to the extraction/injection wells.

### 2.4.2 System Configuration

The pilot study configuration runs north-south and east-west and is proposed to be in the western half of the treatment area designated in the Feasibility Study (Tetra Tech NUS, 1999). At this time little is known about the field performance of these systems; therefore, it is proposed that the vertical and horizontal effectiveness of the SRS equipment be evaluated. The system configuration of the monitoring points will allow for and provide information regarding the vertical and horizontal capabilities of the SRS equipment.

Table 2-4 shows the proposed testing for the pull only (SVE), push only (bioventing) and the push/pull (SVE and bioventing) testing at Site 4. Vertical influence will be evaluated between the extraction/injection well screened intervals using information collected from the macro monitoring points. This data will supplement site geologic information collected during the installation of the monitoring points.

### 2.4.3 System Startup

System startup and testing is proposed to continue for approximately the first two weeks of operation. During this period, information will be collected to evaluate the operational impacts of the various system configurations and testing of monitoring equipment. This testing is proposed to include field parameter measurements and laboratory analytical data.

Prior to each system being attached to the extraction/injection well, a flow versus pressure measurement will be performed to determine and generate an SRS unit blower curve for each of the SRS units. A maximum flow test will also be performed to determine if there is any variability among the SRS units prior to installation.

TABLE 2-4
Pilot Study Proposed Test (Pull Only, Push Only, and Push/Pull) Summary

| Week | 04-TW-02 | 04-TW-01 | 04-TW-03 | 04-TW-04 | 04-TW-05 |
|---|---|---|---|---|---|
| **Shallow** | | | | | |
| 1 | Pull | Off | Off | Off | Off |
| 2 | Pull | Pull | Off | Off | Off |
| 3 | Pull | Off | Pull | Off | Off |
| 4 | Pull | Off | Off | Pull | Off |
| 5 | Pull | Off | Off | Off | Pull |
| 6 | Push | Off | Off | Off | Off |
| 7 | Push | Push | Off | Off | Off |
| 8 | Push | Off | Push | Off | Off |
| 9 | Push | Off | Off | Push | Off |
| 10 | Push | Off | Off | Off | Push |
| 11 | Pull | Push | Off | Off | Off |
| 12 | Pull | Off | Push | Off | Off |
| 13 | Pull | Off | Off | Push | Off |
| 14 | Pull | Off | Off | Off | Push |
| **Intermediate** | | | | | |
| 15 | Pull | Off | Off | Off | Off |
| 16 | Pull | Pull | Off | Off | Off |
| 17 | Pull | Off | Pull | Off | Off |
| 18 | Pull | Off | Off | Pull | Off |
| 19 | Pull | Off | Off | Off | Pull |
| 20 | Push | Off | Off | Off | Off |
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| 25 | Pull | Push | Off | Off | Off |
| 26 | Pull | Off | Push | Off | Off |
| 27 | Pull | Off | Off | Push | Off |
| 28 | Pull | Off | Off | Off | Push |
| **Deep** | | | | | |
| 29 | Pull | Off | Off | Off | Off |
| 30 | Pull | Pull | Off | Off | Off |
| 31 | Pull | Off | Pull | Off | Off |
| 32 | Pull | Off | Off | Pull | Off |
| 33 | Pull | Off | Off | Off | Pull |
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| 37 | Push | Off | Off | Push | Off |
| 38 | Push | Off | Off | Off | Push |
| 39 | Pull | Push | Off | Off | Off |
| 40 | Pull | Off | Push | Off | Off |
| 41 | Pull | Off | Off | Push | Off |
| 42 | Pull | Off | Off | Off | Push |

Once each of the SRS units has been tested to obtain operational capacity information, the units will be attached to the extraction/injection wells. The general operation parameters listed in Table 2-5 will be measured from each of the SRS units throughout the pilot test. All five of the units will be operated for the first three days at maximum flow to determine if the FDEP emissions standard of 13.7 pounds per day is exceeded at any extraction/injection point. Air samples will be collected at 24-hour intervals during this period. This procedure will be repeated for each of the screened intervals (shallow, intermediate, and deep). Section 3 of this work plan outlines the sample locations, analytical methods, and method of sample collection. The data will be evaluated and reported to Southern Division, NAVFAC once analytical results have been received from the laboratory. After this maximum emission test, the pull configuration testing will begin. This testing is described in the following section, Pilot Study Testing.

**TABLE 2-5**
General Operational Measurements

| Measurement Parameter | Measurement Location |
|---|---|
| Hours of Operation | SRS I&C panel (battery powered hour meter) |
| Pressure | At the extraction/injection well head |
| Air Flow Rate | At the effluent of the SRS equipment |
| Temperature | At the effluent of the SRS equipment |
| Relative Humidity | At the effluent of the SRS equipment |
| Contaminant Concentrations | At the effluent of the SRS equipment |

## 2.4.4 Pilot Study Testing

The focus of the pilot study testing is the evaluation of the vertical and horizontal impact of the SRS units at Site 4. This will be completed though a series of tests operating the SRS units in a pull configuration, push configuration, and a push/pull configuration. Due to the treatment well construction, each of the screened intervals will be evaluated independently. The shallow interval will be evaluated first, then the intermediate interval, and finally the deep interval. A total of 42 tests will be run. Each test is scheduled to operate for one-week.

Macro monitoring points will be used to determine if there is vertical influence between the identified geologic layering at the site. Horizontal interaction between the multiple SRS units will aid in determining the zone of influence. Flow rates for the systems will be determined during the start-up period. Air monitoring will be conducted weekly during all of the pull and push/pull testing. Samples will be collected at the end each test. Air emissions will be calculated and general operational parameters will be recorded to aid in the evaluation of the treatment effectiveness and performance of the SRS units.

### Pull System Testing

Once the start-up testing has been completed, the pull system testing in the shallow interval will begin. This first series of tests will evaluate the horizontal influence of the SRS units operating independently and at four distances from one another. A set of five pull tests will

be conducted at each of the depth intervals for a total of 15 tests. These tests begin with a single evaluation of the central system operating independently. The subsequent tests operate systems in parallel at 10, 20, 30 and 40 feet from the central system. The micro and macro monitoring points will be used to evaluate the horizontal and vertical influence of the system configurations.

At the conclusion of each pull test, an air sample will be collected from the central treatment well (04-TW-02). This information will be used to evaluate removal efficiency and emission rate for the system. Flow rates and OVA readings will be collected from all operational systems during the pull testing.

### Push System Testing

The second series of tests will evaluate the same horizontal influence only in the push mode of operation. Identical to the pull testing, this testing will begin in the shallow interval and then proceed to the intermediate and deep intervals. A total of five tests will be conducted at each of the depth intervals. The monitoring for the push testing will be limited to data logging within the micro and macro monitoring points. Changes in pressure and oxygen levels will be monitored and evaluated to determine the horizontal and vertical influence of the treatment wells.

### Push/Pull System Testing

The final series of tests will evaluate the operation of the systems in the push/pull configuration to evaluate the horizontal and vertical influence. Similar to the pull and push testing, the shallow interval will be tested, then the intermediate and the deep. The central system will be operated in the pull mode while the perimeter wells are operated in the push mode. As with the pull only tests, off-gas concentrations will be collected weekly from the central system. During the air sampling, OVA readings and flow measurements will be collected to evaluate the emission rates.

At the conclusion of the push/pull test, soil samples will be collected from the baseline soil sampling locations. These samples will be analyzed for BTEX, PAHs, TRPH, and TOC. Headspace and lithologic data will be collected during the sampling.

### Performance Monitoring

Two mass reduction processes have been identified for evaluation during the pilot testing at Site 4. The first is removal through volatilization and the second is enhanced biodegradation. To measure these parameters, data loggers are proposed for use in the micro and macro monitoring points. Pressure and oxygen have been identified as the two primary parameters to be measured continuously during the pilot study testing. The frequency of the readings will be a function of the tests being conducted. Barometric pressure and rainfall will be measured at the site on the same reading frequency.

## 2.4.5 System Operation and Maintenance

One of the benefits of the SRS is the minimal requirement for system operation and maintenance. To evaluate this, hour meters will be installed on all of the systems. These meters will be used to track the actual run time for the systems. During the proposed monthly sampling/site visits, the system will be checked, the run hours recorded, and any

system abnormalities documented. Replacement of any equipment will be documented along with the general parameters included in Table 2-5.

## 2.5 Site Data Evaluation and Test Completion

At the conclusion of the pilot testing, a report will be prepared to document the performance of the SRS units. This document will specifically focus on the objectives identified in Section 1.0 of this plan. Full-scale implementation of this technology will be evaluated and addressed specific to Site 4.

## 2.6 Project Schedule

The anticipated project schedule is provided in Appendix B.

## 2.7 Communications Plan

A communication matrix outlining the lines of communication for Southern Division, NAVFAC, and CCI personnel is presented in Table 2-6.

**TABLE 2-6**
Communications Matrix

| CH2M HILL/CCI Position | Navy Direct Report |
|---|---|
| Scott Newman, Program Manager | Eva Clement, Contracting Officer |
| Philip Altman, Senior Project Manager | Jimmy Jones, COTR, ACO |
| John Custance, Regional Operations Manager | Linda Martin, RPM |
| Amy Twitty, CTO Project Manager | |

Table 2-7 provides a project personnel directory.

**TABLE 2-7**
Project Personnel Directory

| Contact | Company |
|---|---|
| Scott Newman<br>Philip Altman<br>Bob Nash<br>Marsha Robinson<br>Theresa Rojas<br>John Custance | CH2M HILL Constructors, Inc.<br>115 Perimeter Center Place, N.E.<br>Suite 700<br>Atlanta, GA 30346-1278<br>770/604-9095 |
| Amy Twitty<br>Chris Hood | CH2M HILL<br>1766 Sea Lark lane<br>Navarre, FL 32566<br>850/939-8300 |

**TABLE 2-7**
Project Personnel Directory

| Contact | Company |
|---|---|
| Eva Clement | Southern Division<br>Naval Facilities Engineering Command<br>P.O. Box 190010<br>North Charleston, SC 29419-9010<br>843/820-5916 |
| Jimmy Jones | Southern Division<br>Naval Facilities Engineering Command<br>P.O. Box 190010<br>North Charleston, SC 29419-9010<br>843/820-5544 |
| Linda Martin | Southern Division<br>Naval Facilities Engineering Command<br>P.O. Box 190010<br>North Charleston, SC 29419-9010<br>843/820-5574 |

## 2.8 Reporting

After one year of operation, the data will be compiled and presented in a Pilot Study Completion Report. The report will include a summary of the methodology, compare the final soil analytical results with the baseline results, describe any maintenance problems, and will provide conclusive evidence of the effectiveness of the treatment system. The report will also present a cost-benefit analysis comparing the operating cost of SRS treatment system and its effectiveness to the cost of other remedial techniques including natural attenuation.

The report will be submitted to Navy, Whiting Field, EPA, and FDEP representatives. This team of professionals will determine if the treatment technology is suitable as the final site remedy.

# 3.0 Sampling and Analysis Plan

The Sampling and Analysis Plan provided in this Work Plan Addendum outlines the required sampling activities associated with the installation of an SRS to determine its effectiveness in decreasing BTEX and PAH concentrations in subsurface soil at Site 4, NAS Whiting Field. This plan outlines the required locations, frequency, and analyses for the soil screening and soil samples to be collected during and after installation activities and system operation. In addition, this plan provides the required analyses for disposal characterization for wastes generated during removal activities.

The Basewide Work Plan provides sample collection frequency and sampling methodology for waste characterization and incidental samples collected during the remedial phase of the project completed under this contract, sample quality assurance/quality control procedures to be maintained during all sample collection activities, and sample equipment decontamination procedures (CCI, 1999).

Samples will be collected in accordance with the FDEP Standard Operating Procedures, Department of Environmental Regulation QA-001/92, and the EPA, Region IV Environmental Investigation Standard Operating Procedures and Quality Assurance Manual (EISOPQAM, dated May 1999). The sampling team will have an FDEP-approved Comprehensive Quality Assurance Plan (CompQAP).

## 3.1 Data Quality Objectives for Measurement Data

The data quality objectives for each sampling task described previously are listed in Table 3-1. The sampling and analytical requirements, along with the required level of quality and data packages are listed in Table 3-2. The project-specific quality control objectives for those data are listed in Tables 3-3 through 3-6. These include the quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated.

A Navy-, USACE-, or AFCEE-approved and FDEP-certified laboratory will be used for all sample analyses. In addition, the laboratory will also have an FDEP-approved CompQAP.

**TABLE 3-1**
Data Quality Objectives

| Sampling Activity | Data Quality Objective Category |
|---|---|
| SRS system sampling (Tedlar bags to offsite lab) | Definitive |
| Soil Sampling (field testing) | Screening |
| Soil Sampling (laboratory analysis) | Definitive |
| Air Sampling (in situ data loggers) | Screening |
| Waste characterization of the contaminated aqueous waste (offsite laboratory analyses) | Definitive |

**TABLE 3-2**
Sampling and Analytical Summary

| Sample Task | Sample Point | Matrix | Sampling Frequency | Approx Sample No. | Sampling Method | Sampling Equipment | TAT | DQO Level/ Data Package Reqmnt | Required Analysis | Analytical Method | Holding Time | Sample Preservtion | Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Soil Sampling*** | | | | | | | | | | | | | |
| Soil Sampling to determine system effectiveness | 04-MP-10W-22, 04-MP-10W-43, 04-MP-10W-72, 04-MP-20S-22, 04-MP-20S-43, 04-MP-20S-72, 04-MP-30E-22, 04-MP-30E-43, 04-MP-30E-72, 04-MP-05N-18, 04-MP-05N-38, 04-MP-05N-66, Background-22, Background-43, Background-72 | Soil | Prior to system startup, and after 4, 8, and 12 months of operation | 15 x 4 events + 1 duplicate per event + 1 MS/MSD per event | Grab | EnCore, SS Spoon, SS Bowl | 14 day | DQO Level III, CCI Level C | BTEX | 5035/8021B | 48 hour (not preserved) OR 14 day (if frozen upon receipt) | Cool to 4°C | (3) 5-g EnCore sampler |
| | | | | | | | | | PAHs | 8310 | 14 day extr; 40 day analysis | Cool to 4°C | (1) 8-oz amber glass |
| | | | | | | | | | TRPH | FL-PRO | 14 day extr, 40 day analysis | Cool to 4°C | (1) 8-oz amber glass |
| | | | | | | | | | TOC | 9060 | 14 day extr; 40 day analysis | Cool to 4°C | (1) 4-oz amber glass |
| | | Air | Prior to startup and continuously | | Data loggers | Soil Gas Sample Train | | Screening | Soil Gas ($CH_4$,$H_2S$, LEL,$O_2$,$CO_2$) | | None | None | None |
| | Pre-Equipment Rinsate Blank | Water | 1 per set of pre-cleaned equipment | 4 | Prepared in Field | Analyte-free water, SS funnel | 14 day | DQO Level III, CCI Level C | BTEX | 5035/8021B | 14 day | HCl pH<2; Cool to 4°C | (3) 40-mL glass vial |
| | | | | | | | | | PAHs | 8310 | 7 day extr; 40 day analysis | Cool to 4°C | (2) 1-L amber glass |
| | | | | | | | | | TRPH | FL-PRO | 7 day extr; 40 day analysis | $H_2SO_4$ pH<2; Cool to 4°C | (1) 1-L amber glass |
| | Post-Equipment Rinsate Blank | Water | 1 per set of field-cleaned equipment (if equipment are decontaminated in the field) | 4 | Prepared in Field | Analyte-free water, SS funnel | 14 day | DQO Level III, CCI Level C | BTEX | 5035/8021B | 14 day | HCl pH<2; Cool to 4°C | (3) 40-mL glass vial |
| | | | | | | | | | PAHs | 8310 | 7 day extr; 40 day analysis | Cool to 4°C | (2) 1-L amber glass |
| | | | | | | | | | TRPH | FL-PRO | 7 day extr; 40 day analysis | $H_2SO_4$ pH<2; Cool to 4°C | (1) 1-L amber glass |

**TABLE 3-2**
Sampling and Analytical Summary

| Sample Task | Sample Point | Matrix | Sampling Frequency | Approx Sample No. | Sampling Method | Sampling Equipment | TAT | DQO Level/ Data Package Reqmnt | Required Analysis | Analytical Method | Holding Time | Sample Preservtion | Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trip Blank | Water | 1 per cooler containing volatile samples | 4 | Prepared by Lab | N/A | 14 day | DQO Level III, CCI Level C | BTEX | 5035/8021B | 14 day | HCl pH<2, Cool to 4°C | (3) 40-mL glass vial |
| ***SRS Off-Gas Monitoring*** | | | | | | | | | | | | | |
| Air Sampling of SRS | 04-TW-01(S,I,D), 04-TW-02(S,I,D), 04-TW-03(S,I,D), 04-TW-04(S,I,D), 04-TW-05(S,I,D) | Air | Daily during 1st nine days of operation, Weekly during pull tests (at 04-TW-02) | 135 + 27 = 162 | Grab | Tedlar bag | 14 day | DQO Level III, CCI Level B | BTEX, TRPH | Modified USEPA Method 18 | 72 hour | none | (1) Tedlar bag |
| ***Soil Waste Characterization*** | | | | | | | | | | | | | |
| Soil Characterization Sampling | soil cutting, other generated soilds | Soil | Once | 1 Composite sample made up of 5 Grab samples for roll-off or 1 composite per 6 drums | Auger down to various depths within rolloff in 5 areas or each of 6 drums | SS Auger, SS Spoons, SS Bowl | 14 day | DQO Level III, CCI Level B | TCLP Volatiles | 1311/8260B | 14 day TCLP extr; 14 day analysis | Cool to 4°C | (1) 4-oz amber glass |
| | | | | | | | | | TCLP Semi-Volatiles | 1311/8270C | 14 day TCLP extr; 7 day extr; 40 day analysis | Cool to 4°C | (1) 16-oz amber glass |
| | | | | | | | | | TCLP Pesticides | 1311/8081A | 14 day TCLP extr; 7 day extr; 40 day analysis | Cool to 4°C | see above |
| | | | | | | | | | TCLP Herbicides | 1311/8151A | 14 day TCLP extr; 7 day extr; 40 day analysis | Cool to 4°C | see above |
| | | | | | | | | | TCLP Metals | 1311/6010B, 7470A | 6 month TCLP extr, 6 month analysis Hg: 28 day TCLP extr; 28 day analysis | Cool to 4°C | (1) 16-oz amber glass |
| | | | | | | | | | TRPH | FL-PRO | 14 day extr; 40 day analysis | Cool to 4°C | (1) 8-oz amber glass |

**TABLE 3-2**
Sampling and Analytical Summary

| Sample Task | Sample Point | Matrix | Sampling Frequency | Approx Sample No. | Sampling Method | Sampling Equipment | TAT | DQO Level/ Data Package Reqmnt | Required Analysis | Analytical Method | Holding Time | Sample Preservtion | Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | PCBs | 8082 | 14 day extr, 40 day analysis | Cool to 4°C | (1) 8-oz amber glass |
| | | | | | | | | | Ignitabiltiy | 1030 | ASAP | none | (1) 16-oz amber glass |
| | | | | | | | | | Corrosivity | 9045C | ASAP | none | see above |
| | | | | | | | | | Reactivity | Chapter 7.3 | ASAP | none | see above |
| ***Aqueous Waste Characterization*** | | | | | | | | | | | | | |
| Disposal of Aqueous Waste | Drums/tanks | Water | Once | 1 | Grab | Drum thief or dip jar | 14 day | DQO Level III, CCI Level B | TCL Volatiles | 8260B | 14 day | HCl pH< 2, Cool to 4°C | (3) 40-mL glass vial |
| | | | | | | | | | TCL Semi-volatiles | 8270C | 7 day ext; 40 day analysis | Cool to 4°C | (2) 1-L amber glass |
| | | | | | | | | | TCL Pesticides | 8081A | 7 day ext; 40 day analysis | Cool to 4°C | (2) 1-L amber glass |
| | | | | | | | | | TCL Herbicides | 8151A | 7 day extr; 40 day analysis | Cool to 4°C | (2) 1-L amber glass |
| | | | | | | | | | TCL PCBs | 8082 | 7 day ext; 40 day analysis | Cool to 4°C | (2) 1-L amber glass |
| | | | | | | | | | TRPH | FL-PRO | 7 day extr; 40 day analysis | $H_2SO_4$ pH< 2, Cool to 4°C | (1) 1-L amber glass |
| | | | | | | | | | TAL Metals | 6010B/7470A | 180 days; Hg: 28 days | $HNO_3$ pH< 2, Cool to 4°C | (1) 500-mL HDPE |
| | | | | | | | | | Cyanide | 335.3 | 14 days | Cool to 4°C NaOH pH>12 | (1) 500-mL HDPE |
| | | | | | | | | | Ignitability | 1010/1020A | ASAP | none | (1) 1-L amber glass |
| | | | | | | | | | Corrosivity | 9040B | ASAP | none | see above |
| | | | | | | | | | Reactivity | Chapter 7.3 | ASAP | none | see above |

**TABLE 3-3**
Project Quality Control Objectives for Air Methods

| Method No | Analyte | Project Action Limits | Minimum PQL | Accuracy Limits Audit Accuracy Recoveries | Precision Limits Field Duplicate Deviation | Completeness Limits |
|---|---|---|---|---|---|---|
| | | Air | Air | Air | Air | Air |
| | | ppbv | ppbv | % | % | % |
| EPA-18 | Benzene | NS | 0.34 | 70-130 | <30 | 95 |
| EPA-18 | Ethylbenzene | NS | 0.27 | 70-130 | <30 | 95 |
| EPA-18 | Toluene | NS | 0.99 | 70-130 | <30 | 95 |
| EPA-18 | m-, p-Xylene | NS | 0.76 | 70-130 | <30 | 95 |
| EPA-18 | o-Xylene | NS | 0.57 | 70-130 | <30 | 95 |
| EPA-18 | TRPH | NS | 15 | 70-130 | <30 | 95 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Method No | Analyte / Component | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil |
| TCL VOLATILES BY GC/MS | | ug/L | ug/kg | ug/L** | ug/kg | % | % | % | % | % | % | % | % | % | % |
| 8260B | Chloromethane | NS | NS | 1.3 | 10 | 60-140 | 20-150 | <30 | <50 | 38-116 | 38-116 | <50 | <75 | 95 | 90 |
| 8260B | Bromomethane | NS | NS | 1.1 | 10 | 60-140 | 20-150 | <30 | <50 | 49-117 | 49-117 | <50 | <75 | 95 | 90 |
| 8260B | Vinyl Chloride | NS | NS | 1.1 | 10 | 60-140 | 20-150 | <30 | <50 | 31-121 | 31-121 | <50 | <75 | 95 | 90 |
| 8260B | Chloroethane | NS | NS | 1 | 10 | 60-140 | 20-150 | <30 | <50 | 62-116 | 62-116 | <50 | <75 | 95 | 90 |
| 8260B | Methylene Chloride | NS | NS | 0.3 | 10 | 60-140 | 20-150 | <30 | <50 | 55-126 | 55-126 | <50 | <75 | 95 | 90 |
| 8260B | Acetone | NS | NS | 10 | 10 | 60-140 | 20-150 | <30 | <50 | 43-165 | 43-165 | <50 | <75 | 95 | 90 |
| 8260B | Carbon Disulfide | NS | NS | 10 | 10 | 60-140 | 20-150 | <30 | <50 | 76-119 | 76-119 | <50 | <75 | 95 | 90 |
| 8260B | 1,1-Dichloroethene | NS | NS | 1.2 | 10 | 60-140 | 20-150 | <30 | <50 | 54-128 | 54-128 | <50 | <75 | 95 | 90 |
| 8260B | 1,1-Dichloroethane | NS | NS | 0.4 | 10 | 60-140 | 20-150 | <30 | <50 | 62-141 | 62-141 | <50 | <75 | 95 | 90 |
| 8260B | cis-1,2-Dichloroethene | NS | NS | 1.2 | 10 | 60-140 | 20-150 | <30 | <50 | 70-131 | 60-141 | <50 | <75 | 95 | 90 |
| 8260B | trans-1,2-Dichloroethene | NS | NS | 0.6 | 10 | 60-140 | 20-150 | <30 | <50 | 61-138 | 51-148 | <50 | <75 | 95 | 90 |
| 8260B | Chloroform | NS | NS | 0.3 | 10 | 60-140 | 20-150 | <30 | <50 | 65-129 | 65-129 | <50 | <75 | 95 | 90 |
| 8260B | 1,2-Dichloroethane | NS | NS | 0.6 | 10 | 60-140 | 20-150 | <30 | <50 | 68-135 | 68-135 | <50 | <75 | 95 | 90 |
| 8260B | 2-Butanone | NS | NS | 10 | 10 | 60-140 | 20-150 | <30 | <50 | 50-163 | 50-163 | <50 | <75 | 95 | 90 |
| 8260B | 1,1,1-Trichloroethane | NS | NS | 0.8 | 10 | 60-140 | 20-150 | <30 | <50 | 68-135 | 68-135 | <50 | <75 | 95 | 90 |
| 8260B | Carbon Tetrachloride | NS | NS | 2.1 | 10 | 60-140 | 20-150 | <30 | <50 | 67-125 | 67-125 | <50 | <75 | 95 | 90 |
| 8260B | Bromodichloromethane | NS | NS | 0.8 | 10 | 60-140 | 20-150 | <30 | <50 | 68-135 | 58-145 | <50 | <75 | 95 | 90 |
| 8260B | 1,2-Dichloropropane | NS | NS | 0.4 | 10 | 60-140 | 20-150 | <30 | <50 | 76-132 | 76-132 | <50 | <75 | 95 | 90 |
| 8260B | Cis-1,3-Dichloropropene | NS | NS | 1 | 10 | 60-140 | 20-150 | <30 | <50 | 70-122 | 70-122 | <50 | <75 | 95 | 90 |
| 8260B | Trichloroethylene | NS | NS | 1 | 10 | 60-140 | 20-150 | <30 | <50 | 67-137 | 67-137 | <50 | <75 | 95 | 90 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Method No** | **Analyte / Component** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** |
| 8260B | Dibromochloromethane | NS | NS | 0.5 | 10 | 60-140 | 20-150 | <30 | <50 | 64-120 | 64-120 | <50 | <75 | 95 | 90 |
| 8260B | 1,1,2-Trichloroethane | NS | NS | 1 | 10 | 60-140 | 20-150 | <30 | <50 | 70-141 | 70-141 | <50 | <75 | 95 | 90 |
| 8260B | Benzene | NS | NS | 0.4 | 10 | 60-140 | 20-150 | <30 | <50 | 51-139 | 51-139 | <50 | <75 | 95 | 90 |
| 8260B | trans-1,3-Dichloropropene | NS | NS | 1.4 | 10 | 60-140 | 20-150 | <30 | <50 | 42-154 | 42-154 | <50 | <75 | 95 | 90 |
| 8260B | Bromoform | NS | NS | 1.2 | 10 | 60-140 | 20-150 | <30 | <50 | 67-129 | 67-129 | <50 | <75 | 95 | 90 |
| 8260B | 4-Methyl-2-Pentanone | NS | NS | 10 | 10 | 60-140 | 20-150 | <30 | <50 | 77-119 | 77-119 | <50 | <75 | 95 | 90 |
| 8260B | 2-Hexanone | NS | NS | 10 | 10 | 60-140 | 20-150 | <30 | <50 | 47-165 | 47-165 | <50 | <75 | 95 | 90 |
| 8260B | Tetrachloroethylene | NS | NS | 1.4 | 10 | 60-140 | 20-150 | <30 | <50 | 67-131 | 67-131 | <50 | <75 | 95 | 90 |
| 8260B | Toluene | NS | NS | 1.1 | 10 | 60-140 | 20-150 | <30 | <50 | 31-137 | 31-137 | <50 | <75 | 95 | 90 |
| 8260B | 1,1,2,2-Tetrachloroethane | NS | NS | 0.4 | 10 | 60-140 | 20-150 | <30 | <50 | 55-138 | 55-138 | <50 | <75 | 95 | 90 |
| 8260B | Chlorobenzene | NS | NS | 0.4 | 10 | 60-140 | 20-150 | <30 | <50 | 69-140 | 69-140 | <50 | <75 | 95 | 90 |
| 8260B | Ethylbenzene | NS | NS | 0.6 | 10 | 60-140 | 20-150 | <30 | <50 | 59-140 | 59-140 | <50 | <75 | 95 | 90 |
| 8260B | Styrene | NS | NS | 0.4 | 10 | 60-140 | 20-150 | <30 | <50 | 71-133 | 71-133 | <50 | <75 | 95 | 90 |
| 8260B | Xylenes, Total | NS | NS | 1.3 | 10 | 60-140 | 20-150 | <30 | <50 | 68-133 | 68-133 | <50 | <75 | 95 | 90 |
| 8260B | 4-Bromofluorobenzene (Surr) | | | | | 75-125 | 65-135 | | | | | | | | |
| 8260B | 1,2-Dichloroethane-d4 (Surr) | | | | | 62-139 | 52-149 | | | | | | | | |
| 8260B | Toluene-d8 (Surr) | | | | | 75-125 | 65-135 | | | | | | | | |
| **TCL SEMI-VOLATILES BY GC/MS** | | **ug/L** | **ug/kg** | **ug/L** | **ug/kg** | **ug/L** | **ug/kg** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| 8270C | Phenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 25-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | Bis (2-chloroethyl) ether | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 44-125 | 34-135 | <50 | <75 | 95 | 90 |
| 8270C | 2-Chlorophenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 41-125 | 31-135 | <50 | <75 | 95 | 90 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Method No | Analyte / Component | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil |
| 8270C | 1,3-Dichlorobenzene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 36-125 | 26-135 | <50 | <75 | 95 | 90 |
| 8270C | 1,4-Dichlorobenzene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 30-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | 1,2-Dichlorobenzene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 42-155 | 32-135 | <50 | <75 | 95 | 90 |
| 8270C | 2-Methylphenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 25-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | 2,2'-Oxybis (1-Chloropropane) [bis (2-Chloroisopropyl) ether] | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 36-166 | 26-175 | <50 | <75 | 95 | 90 |
| 8270C | 4-Methylphenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 33-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | N-Nitroso-di-n-propylamine | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 37-125 | 27-135 | <50 | <75 | 95 | 90 |
| 8270C | Hexachloroethane | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 25-153 | 25-163 | <50 | <75 | 95 | 90 |
| 8270C | Nitrobenzene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 46-133 | 36-143 | <50 | <75 | 95 | 90 |
| 8270C | Isophorone | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 26-175 | 25-175 | <50 | <75 | 95 | 90 |
| 8270C | 2-Nitrophenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 44-125 | 34-135 | <50 | <75 | 95 | 90 |
| 8270C | 2,4-Dimethylphenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 45-139 | 35-149 | <50 | <75 | 95 | 90 |
| 8270C | Bis (2-chloroethoxy) methane | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 49-125 | 39-135 | <50 | <75 | 95 | 90 |
| 8270C | 2,4-Dichlorophenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 46-125 | 36-135 | <50 | <75 | 95 | 90 |
| 8270C | 1,2,4-Trichlorobenzene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 44-142 | 34-152 | <50 | <75 | 95 | 90 |
| 8270C | Naphthalene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 50-125 | 40-135 | <50 | <75 | 95 | 90 |
| 8270C | 4-Chloroaniline | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 45-136 | 35-146 | <50 | <75 | 95 | 90 |
| 8270C | Hexachlorobutadiene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 25-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | 4-Chloro-3-methylphenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 44-125 | 34-135 | <50 | <75 | 95 | 90 |
| 8270C | 2-Methylnaphthalene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 41-125 | 31-135 | <50 | <75 | 95 | 90 |
| 8270C | Hexachlorocyclopentadiene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 41-125 | 31-135 | <50 | <75 | 95 | 90 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Method No | Analyte / Component | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil |
| 8270C | 2,4,6-Trichlorophenol | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 39-128 | 29-138 | <50 | <75 | 95 | 90 |
| 8270C | 2,4,5-Trichlorophenol | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 25-175 | 25-175 | <50 | <75 | 95 | 90 |
| 8270C | 2-Chloronaphthalene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 60-125 | 50-135 | <50 | <75 | 95 | 90 |
| 8270C | 2-Nitroaniline | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 50-125 | 40-135 | <50 | <75 | 95 | 90 |
| 8270C | Dimethyl phthalate | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 25-175 | 25-175 | <50 | <75 | 95 | 90 |
| 8270C | Acenaphthylene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 47-125 | 37-135 | <50 | <75 | 95 | 90 |
| 8270C | 2,6-Dinitrotoluene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 51-125 | 41-135 | <50 | <75 | 95 | 90 |
| 8270C | 3-Nitroaniline | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 51-125 | 41-135 | <50 | <75 | 95 | 90 |
| 8270C | Acenaphthene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 49-124 | 39-135 | <50 | <75 | 95 | 90 |
| 8270C | 2,4-Dinitrophenol | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 30-151 | 25-161 | <50 | <75 | 95 | 90 |
| 8270C | 4-Nitrophenol | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 25-131 | 25-141 | <50 | <75 | 95 | 90 |
| 8270C | Dibenzofuran | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 52-125 | 42-135 | <50 | <75 | 95 | 90 |
| 8270C | 2,4-Dinitrotoluene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 39-139 | 29-149 | <50 | <75 | 95 | 90 |
| 8270C | Diethyl phthalate | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 37-125 | 27-135 | <50 | <75 | 95 | 90 |
| 8270C | 4-Chlorophenyl-phenyl ether | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 51-132 | 41-142 | <50 | <75 | 95 | 90 |
| 8270C | Fluorene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 48-139 | 38-149 | <50 | <75 | 95 | 90 |
| 8270C | 4-Nitroaniline | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 40-143 | 30-153 | <50 | <75 | 95 | 90 |
| 8270C | 4,6-Dinitro-2-methylphenol | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 26-134 | 25-144 | <50 | <75 | 95 | 90 |
| 8270C | N-Nitrosodiphenylamine | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 27-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | 4-Bromophenyl-phenyl ether | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 53-127 | 43-137 | <50 | <75 | 95 | 90 |
| 8270C | Hexachlorobenzene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 46-133 | 36-143 | <50 | <75 | 95 | 90 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Method No | Analyte / Component | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil |
| 8270C | Pentachlorophenol | NS | NS | 25 | 800 | 60-140 | 20-150 | <30 | <50 | 28-136 | 38-146 | <50 | <75 | 95 | 90 |
| 8270C | Phenanthrene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 54-125 | 44-135 | <50 | <75 | 95 | 90 |
| 8270C | Anthracene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 45-165 | 35-175 | <50 | <75 | 95 | 90 |
| 8270C | Carbazole | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 34-132 | 34-132 | <50 | <75 | 95 | 90 |
| 8270C | Di-n-butylphthalate | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 34-126 | 25-136 | <50 | <75 | 95 | 90 |
| 8270C | Fluoranthene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 47-125 | 37-135 | <50 | <75 | 95 | 90 |
| 8270C | Pyrene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 47-136 | 37-146 | <50 | <75 | 95 | 90 |
| 8270C | Butylbenzylphthalate | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 26-125 | 25-135 | <50 | <75 | 95 | 90 |
| 8270C | 3,3'-Dichlorobenzidine | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 29-175 | 25-175 | <50 | <75 | 95 | 90 |
| 8270C | Benzo (a) anthracene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 51-133 | 41-143 | <50 | <75 | 95 | 90 |
| 8270C | Chrysene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 55-133 | 45-143 | <50 | <75 | 95 | 90 |
| 8270C | bis (2-Ethylhexyl) phthalate | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 33-129 | 25-139 | <50 | <75 | 95 | 90 |
| 8270C | Di-n-octylphthalate | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 38-127 | 28-137 | <50 | <75 | 95 | 90 |
| 8270C | Benzo (b) fluoranthene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 37-125 | 27-135 | <50 | <75 | 95 | 90 |
| 8270C | Benzo (k) fluoranthene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 37-123 | 37-123 | <50 | <75 | 95 | 90 |
| 8270C | Benzo (a) pyrene | NS | NS | 10 | 830 | 60-140 | 20-150 | <30 | <50 | 41-125 | 31-135 | <50 | <75 | 95 | 90 |
| 8270C | Indeno (1,2,3-cd) pyrene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 27-160 | 25-170 | <50 | <75 | 95 | 90 |
| 8270C | Dibenzo (a,h) anthracene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 50-125 | 40-135 | <50 | <75 | 95 | 90 |
| 8270C | Benzo (g,h,i) perylene | NS | NS | 10 | 330 | 60-140 | 20-150 | <30 | <50 | 34-149 | 25-159 | <50 | <75 | 95 | 90 |
| 8270C | Nitrobenzene-d5 | | | | | 35-114 | 23-120 | | | | | | | | |
| 8270C | 2-Fluorobiphenyl | | | | | 43-116 | 30-115 | | | | | | | | |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Method No** | **Analyte / Component** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** |
| 8270C | Terphenyl-d14 | | | | | 33-141 | 18-137 | | | | | | | | |
| 8270C | Phenol-d5 | | | | | 10-110 | 24-113 | | | | | | | | |
| 8270C | 2-Fluorophenol | | | | | 21-110 | 25-121 | | | | | | | | |
| 8270C | 2,4,6-Tribromophenol | | | | | 10-123 | 19-122 | | | | | | | | |
| 8270C | 2-Chlorophenol-d4 | | | | | 33-110 | 20-130 | | | | | | | | |
| 8270C | 1,2-Dichorobenzene-d4 | | | | | 16-110 | 20-130 | | | | | | | | |
| **TCL PESTICIDES/AROCHLORS** | | **ug/L** | **ug/kg** | **ug/L** | **ug/kg** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| 8081A | alpha-BHC | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 75-125 | 65-135 | <50 | <75 | 95 | 90 |
| 8081A | beta-BHC | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 51-125 | 41-133 | <50 | <75 | 95 | 90 |
| 8081A | delta-BHC | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 75-126 | 65-136 | <50 | <75 | 95 | 90 |
| 8081A | gamma-BHC (Lindane) | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 73-125 | 63-130 | <50 | <75 | 95 | 90 |
| 8081A | Heptachlor | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 45-128 | 35-138 | <50 | <75 | 95 | 90 |
| 8081A | Aldrin | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 47-125 | 37-126 | <50 | <75 | 95 | 90 |
| 8081A | Heptachlor epoxide | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 53-134 | 43-144 | <50 | <75 | 95 | 90 |
| 8081A | Endosulfan I | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 49-143 | 39-153 | <50 | <75 | 95 | 90 |
| 8081A | Dieldrin | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 42-132 | 32-142 | <50 | <75 | 95 | 90 |
| 8081A | 4,4'-DDE | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 45-139 | 35-149 | <50 | <75 | 95 | 90 |
| 8081A | Endrin | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 43-134 | 33-144 | <50 | <75 | 95 | 90 |
| 8081A | Endosulfan II | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 75-159 | 65-169 | <50 | <75 | 95 | 90 |
| 8081A | 4,4'-DDD | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 48-136 | 38-146 | <50 | <75 | 95 | 90 |
| 8081A | Endosulfan sulfate | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 46-141 | 36-151 | <50 | <75 | 95 | 90 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Method No | Analyte / Component | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil |
| 8081A | 4,4'-DDT | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 34-143 | 25-153 | <50 | <75 | 95 | 90 |
| 8081A | Methoxychlor | NS | NS | 0.50 | 17 | 60-140 | 20-150 | <30 | <50 | 73-142 | 63-152 | <50 | <75 | 95 | 90 |
| 8081A | Endrin ketone | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 43-134 | 33-144 | <50 | <75 | 95 | 90 |
| 8081A | Endrin aldehyde | NS | NS | 0.10 | 3.3 | 60-140 | 20-150 | <30 | <50 | 75-150 | 35-160 | <50 | <75 | 95 | 90 |
| 8081A | alpha-Chlordane | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 41-125 | 31-135 | <50 | <75 | 95 | 90 |
| 8081A | gamma-Chlordane | NS | NS | 0.050 | 1.7 | 60-140 | 20-150 | <30 | <50 | 41-125 | 31-133 | <50 | <75 | 95 | 90 |
| 8081A | Toxaphene | NS | NS | 5.0 | 170 | 60-140 | 20-150 | <30 | <50 | 41-126 | 31-136 | <50 | <75 | 95 | 90 |
| 8081A | Decachlorobiphenyl (DCBP) (Surr) | | | | | 34-133 | 25-143 | | | | | | | | |
| 8081A | Tetrachloro-m-xylene (TCMX) (Surr) | | | | | 45-125 | 35-135 | | | | | | | | |
| 8082 | Arochlor-1016 | NS | NS | 1.0 | 33 | 60-140 | 20-150 | <30 | <50 | 54-125 | 44-127 | <50 | <75 | 95 | 90 |
| 8082 | Arochlor-1221 | NS | NS | 2.0 | 67 | 60-140 | 20-150 | <30 | <50 | 41-126 | 31-136 | <50 | <75 | 95 | 90 |
| 8082 | Arochlor-1232 | NS | NS | 1.0 | 33 | 60-140 | 20-150 | <30 | <50 | 41-126 | 31-136 | <50 | <75 | 95 | 90 |
| 8082 | Arochlor-1242 | NS | NS | 1.0 | 33 | 60-140 | 20-150 | <30 | <50 | 39-150 | 29-160 | <50 | <75 | 95 | 90 |
| 8082 | Arochlor-1248 | NS | NS | 1.0 | 33 | 60-140 | 20-150 | <30 | <50 | 41-126 | 31-136 | <50 | <75 | 95 | 90 |
| 8082 | Arochlor-1254 | NS | NS | 1.0 | 33 | 60-140 | 20-150 | <30 | <50 | 29-131 | 25-141 | <50 | <75 | 95 | 90 |
| 8082 | Arochlor-1260 | NS | NS | 1.0 | 33 | 60-140 | 20-150 | <30 | <50 | 41-126 | 31-136 | <50 | <75 | 95 | 90 |
| 8082 | Decachlorobiphenyl (DCBP) (Surr) | | | | | 34-133 | 25-143 | | | | | | | | |
| 8082 | Tetrachloro-m-xylene (TCMX) (Surr) | | | | | 45-125 | 35-135 | | | | | | | | |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Method No | Analyte / Component | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil | Water | Soil |
| **TAL METALS BY ICP** | | mg/L | mg/kg | mg/L | mg/kg | mg/L | mg/kg | % | % | % | % | % | % | % | % |
| 6010B | Aluminum | NS | NA | 0.2 | 22.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Antimony | NS | NA | 0.06 | 10.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Arsenic | NS | NA | 0.01 | 40.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Barium | NS | NA | 0.2 | 1.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Beryllium | NS | NA | 0.005 | 1.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Cadmium | NS | NA | 0.005 | 0.50 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Calcium | NS | NA | 5 | 100 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Chromium | NS | NA | 0.01 | 20 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Cobalt | NS | NA | 0.05 | 10.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Copper | NS | NA | 0.025 | 2.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Iron | NS | NA | 0.1 | 3.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Lead | NS | NA | 0.003 | 10.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Magnesium | NS | NA | 5 | 100 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Manganese | NS | NA | 0.015 | 2.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Nickel | NS | NA | 0.04 | 2.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Potassium | NS | NA | 5 | 600 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Selenium | NS | NA | 0.005 | 3.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Silver | NS | NA | 0.01 | 1.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Sodium | NS | NA | 5 | 10.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Thallium | NS | NA | 0.01 | 6.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |

**TABLE 3-4**
Project Quality Control Objectives for TAL and TCL Methods

| | | Project Action Limits | | Minimum PQL | | Accuracy Limits MS/MSD Recoveries | | Precision Limits MS/MSD Deviation | | Accuracy Limits LCS Recoveries | | Precision Limits Field Dup Deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Method No** | **Analyte / Component** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** | **Water** | **Soil** |
| 6010B | Vanadium | NS | NA | 0.05 | 1.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| 6010B | Zinc | NS | NA | 0.02 | 1.0 | 50-150 | 30-170 | <30 | <50 | 80-120 | 80-120 | <50 | <75 | 95 | 90 |
| **TAL METALS BY GFAA** | | **mg/L** | **mg/kg** | **mg/L** | **mg/kg** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| 7041 | Antimony | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| 7060A | Arsenic | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 74-120 | 74-1120 | <50 | <75 | 95 | 90 |
| 7091 | Beryllium | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| 7131A | Cadmium | NS | NA | 0.001 | 0.1 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| 7191 | Chromium | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| 7421 | Lead | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| 7740 | Selenium | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 70-125 | 70-125 | <50 | <75 | 95 | 90 |
| 7761 | Silver | NS | NA | 0.005 | 0.5 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| 7841 | Thallium | NS | NA | 0.001 | 0.1 | 50-150 | 30-170 | <30 | <50 | 75-125 | 75-125 | <50 | <75 | 95 | 90 |
| **MERCURY BY COLD VAPOR** | | **mg/L** | **mg/kg** | **mg/L** | **mg/kg** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| 7470 | Mercury | NS | NA | 0.001 | NA | 50-150 | NA | <30 | NA | 70-130 | NA | <50 | NA | 95 | NA |
| 7471 | Mercury | NA | NS | NA | NA | 50-150 | NA | <30 | NA | 70-130 | NA | <50 | NA | 95 | NA |
| **CYANIDE** | | **mg/L** | **mg/kg** | **mg/L** | **mg/kg** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** |
| 9010A/9012 | Cyanide | NS | NA | 0.010 | NA | 50-150 | NA | <30 | NA | 75-125 | NA | <30 | NA | 95 | NA |
| 9013 | Cyanide | NA | NS | NA | 0.020 | NA | 30-170 | NA | <50 | NA | 75-125 | NA | <50 | NA | 90 |

1. SW-846 Methods unless otherwise noted
2. Includes sediments, waste, solids
NS = Not Specified
NA = Not Applicable

**TABLE 3-5**
Project Quality Control Objectives for Wet Chemistry Methods

| Method Number [1] | Analyte/Component | Project Action Limits | | Minimum PQL | | Accuracy Limits [3] MS/MSD recoveries | | Precision Limits [3] MS/MSD deviation | | Accuracy Limits [3] LCS recoveries | | Precision Limits [3] Field Dup deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Water | Soil [2] | Water | Soil [2] | Water | Soil [2] | Water | Soil [2] | Water | Soil [2] | Water | Soil [2] | Water | Soil [2] |
| | | mg/L | mg/kg | mg/L | mg/kg | % | % | % | % | % | % | % | % | % | % |
| **WET CHEMISTRY** | | | | | | | | | | | | | | | |
| 305.1 | Acidity | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 310.1 | Alkalinity | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 350.2 | Ammonia | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9056 | Bromide | | N/A | | N/A | 70-130 | 70-130 | <30 | <50 | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 5050 | Chloride | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 325.3 | Chloride | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 300.0 | Chloride | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9252 | Chloride | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| SM 3500D | Chromium, Hexavalent | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9010 | Cyanide, Amenable | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 7.3.3.2 | Cyanide, Reactive | | N/A | | N/A | 70-130 | 70-130 | <30 | <50 | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 9010 | Cyanide, Total | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9010A | Cyanide, Total | N/A | | N/A | | N/A | 70-130 | N/A | <50 | N/A | 70-130 | N/A | <50 | N/A | 90 |
| 1010 | Flash Point, Pensky-Martens | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 1020 | Flash Point, SetaFlash | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 340.2 | Fluoride | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9056 | Nitrate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9056 | Nitrite | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| | o-Phosphate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| | Sulfate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 353.2 | Nitrate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 353.2 | Nitrite | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| | o-Phosphate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |

**TABLE 3-5**
Project Quality Control Objectives for Wet Chemistry Methods

| Method Number[1] | Analyte/Component | Project Action Limits | | Minimum PQL | | Accuracy Limits[3] MS/MSD recoveries | | Precision Limits[3] MS/MSD deviation | | Accuracy Limits[3] LCS recoveries | | Precision Limits[3] Field Dup deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] |
| | | mg/L | mg/kg | mg/L | mg/kg | % | % | % | % | % | % | % | % | % | % |
| | Sulfate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9095 | Paint Filter Test | N/A | | N/A | | N/A | N/A | N/A | <50 | N/A | N/A | N/A | <50 | N/A | 90 |
| 9040 | pH, Electrometric | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9045 | pH, Electrometric | N/A | | N/A | | N/A | 70-130 | N/A | <50 | N/A | 70-130 | N/A | <50 | N/A | 90 |
| 9065 | Phenolics, Tot Recov | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 365.2 | Phosphorus, Total | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 160.1 | Residue, Filterable | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 160.2 | Residue, Nonfilterable | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 160.3 | Residue, Total | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 120.1 | Specific Conductance | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| SM 4500D | Sulfate | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 7.3.4.2 | Sulfide, Reactive | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 7.3.4.2 | Sulfide, Reactive | N/A | | N/A | | N/A | 70-130 | N/A | <50 | N/A | 70-130 | N/A | <50 | N/A | 90 |
| SM 5310C | Total Organic Carbon | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 9060 | Total Organic Carbon | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| 180.1 | Turbidity | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| SM 214A | Turbidity | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| SM 209B | Solids, Total Dissolved | | N/A | | N/A | 70-130 | N/A | <30 | N/A | 70-130 | N/A | <30 | N/A | 95 | N/A |
| **METALS** | | | | | | | | | | | | | | | |
| 200.7 | Aluminum | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Antimony | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Arsenic | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Barium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Beryllium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |

**TABLE 3-5**
Project Quality Control Objectives for Wet Chemistry Methods

| Method Number [1] | Analyte/Component | Project Action Limits | | Minimum PQL | | Accuracy Limits[3] MS/MSD recoveries | | Precision Limits[3] MS/MSD deviation | | Accuracy Limits[3] LCS recoveries | | Precision Limits[3] Field Dup deviation | | Completeness Limits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] | Water | Soil[2] |
| | | mg/L | mg/kg | mg/L | mg/kg | % | % | % | % | % | % | % | % | % | % |
| 200.7 | Cadmium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Calcium | | | | | 30-150 | | <30 | | 30-150 | 30-150 | <30 | <50 | 95 | 90 |
| 200.7 | Chromium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Cobalt | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Copper | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Iron | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Lead | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Magnesium | | | | | 50-130 | | <30 | | 50-130 | 50-130 | <30 | <50 | 95 | 90 |
| 200.7 | Manganese | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Molybdenum | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Nickel | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Potassium | | | | | 50-130 | | <30 | | 50-130 | 50-130 | <30 | <50 | 95 | 90 |
| 200.7 | Selenium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Sodium | | | | | 30-150 | | <30 | | 30-150 | 30-150 | <30 | <50 | 95 | 90 |
| 200.7 | Thallium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Tin | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Vanadium | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |
| 200.7 | Zinc | | | | | 70-130 | | <30 | | 70-130 | 70-130 | <30 | <50 | 95 | 90 |

1. SW-846 Methods unless otherwise noted
2. Includes sediments, waste, solids
NS = Not Specified
NA = Not Applicable

**TABLE 3-6**
Project Quality Control Objectives for TCLP Methods

| Method No | Analyte / Component | Project Action Limits | Minimum PQL | Accuracy Limits MS/MSD Recoveries | Precision Limits MS/MSD Deviation | Accuracy Limits LCS Recoveries | Precision Limits Field Dup Deviation | Completeness Limits |
|---|---|---|---|---|---|---|---|---|
| | | TCLP | TCLP | TCLP | TCLP | TCLP | TCLP | TCLP |
| **TCLP Volatiles** | | (mg/L) | (mg/L) | (%) | (%) | (%) | (%) | (%) |
| 8260B | 1,1-Dichloroethylene | 0.7 | 0.1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | 1,2-Dichloroethane | 0.5 | 0.1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Benzene | 0.5 | 0.1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Carbon Tetrachloride | 0.5 | 0.1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Chlorobenzene | 100 | 20 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Chloroform | 6 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Methyl Ethyl Ketone | 200 | 20 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Tetrachloroethylene | 0.7 | 0.7 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Trichloroethylene | 0.5 | 0.1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8260B | Vinyl Chloride | 0.2 | 0.05 | 50-150 | <50 | 70-130 | <50 | 90 |
| **TCLP Semi-Volatiles** | | (mg/L) | (mg/L) | (%) | (%) | (%) | (%) | (%) |
| 8270C | 1,4-Dichlorobenzene | 7.5 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | 2,4,5-Trichlorophenol | 400 | 80 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | 2,4,6-Trichlorophenol | 2 | 0.4 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | 2,4-Dinitrotoluene | 0.13 | 0.02 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Cresol | 200 | 40 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Hexachlorobenzene | 0.13 | 0.02 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Hexachloroethane | 3 | 0.5 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Hexachlorobutadiene | 0.5 | 0.4 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Nitrobenzene | 2 | 0.4 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Pentachlorophenol | 100 | 80 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8270C | Pyridine | 5 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| **TCLP Pesticides** | | (mg/L) | (mg/L) | (%) | (%) | (%) | (%) | (%) |
| 8081A | Endrin | 0.02 | 0.004 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8081A | Lindane | 0.4 | 0.08 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8081A | Methoxychlor | 10 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8081A | Toxaphene | 0.5 | 0.1 | 50-150 | <50 | 70-130 | <50 | 90 |

**TABLE 3-6**
Project Quality Control Objectives for TCLP Methods

| Method No | Analyte / Component | Project Action Limits | Minimum PQL | Accuracy Limits MS/MSD Recoveries | Precision Limits MS/MSD Deviation | Accuracy Limits LCS Recoveries | Precision Limits Field Dup Deviation | Completeness Limits |
|---|---|---|---|---|---|---|---|---|
| | | TCLP | TCLP | TCLP | TCLP | TCLP | TCLP | TCLP |
| 8081A | Chlordane | 0.03 | 0.005 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8081A | Heptachlor and its Hydroxide | 0.008 | 0.001 | 50-150 | <50 | 70-130 | <50 | 90 |
| **TCLP Herbicides** | | **(mg/L)** | **(mg/L)** | **(%)** | **(%)** | **(%)** | **(%)** | **(%)** |
| 8151A | 2,4-D | 10 | 2 | 50-150 | <50 | 70-130 | <50 | 90 |
| 8151A | 2,4,5-TP | 1 | 0.2 | 50-150 | <50 | 70-130 | <50 | 90 |
| **TCLP Metals** | | **(mg/L)** | **(mg/L)** | **(%)** | **(%)** | **(%)** | **(%)** | **(%)** |
| 6010B | Arsenic | 5 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 6010B | Barium | 100 | 20 | 50-150 | <50 | 70-130 | <50 | 90 |
| 6010B | Cadmium | 1 | 0.2 | 50-150 | <50 | 70-130 | <50 | 90 |
| 6010B | Chromium | 5 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 6010B | Lead | 5 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| 7470 | Mercury | 0.2 | 0.04 | 50-150 | <50 | 70-130 | <50 | 90 |
| 6010B | Selenium | 1 | 0.2 | 50-150 | <50 | 70-130 | <50 | 90 |
| 6010B | Silver | 5 | 1 | 50-150 | <50 | 70-130 | <50 | 90 |
| **Characteristics** | | **(mg/kg)** | **(mg/kg)** | **(%)** | **(%)** | **(%)** | **(%)** | **(%)** |
| 7.3 | Reactive Sulfide | 500 | 50 | N/A | <50 | N/A | <50 | 90 |
| 7.3 | Reactive Cyanide | 250 | 25 | N/A | <50 | N/A | <50 | 90 |
| 1010 | Ignitability (Pensky Martens) | < 60 C or <140oF | 40 C or 100oF | N/A | <50 | N/A | <50 | 90 |
| 1020A | Ignitability (Setaflash) | < 60 C or <140oF | 40 C or 100oF | N/A | <50 | N/A | <50 | 90 |
| 1030 | Ignitability of Solids | < 60 C or <140oF | 40 C or 100oF | N/A | <50 | N/A | <50 | 90 |
| 9040 | pH (Corrosivity) | ≤2 ; ≥12.5 | N/A | N/A | <50 | N/A | <50 | 90 |
| **Miscellaneous** | | | | **(%)** | **(%)** | **(%)** | **(%)** | **(%)** |
| 9095A | Paint Filter | Pass | Pass/Fail | N/A | N/A | N/A | N/A | 90 |

1. SW-846 Methods unless otherwise noted
2. Includes sediments, waste, solids
NS = Not Specified
NA = Not Applicable

## 3.2 Baseline Soil Sampling and Analyses

To evaluate the initial conditions (baseline) of the site and the effectiveness of the SRS system in decreasing the amount of VOC and SVOC concentrations, soil samples will be collected in accordance with FDEP Standard Operating Procedures for Laboratory Operations and Sample Collection Activities, DEP-QA-001/92, which were adopted as part of CCI's and its subcontractors' FDEP-Approved CompQAP and EPA Region IV's ElsopQAM and analyzed in accordance with Table 3-2. Samples will be collected prior to system startup, and after four, eight, and 12 months of system operation. Samples will generally be collected from the split spoon as follows:

### 3.2.1 Procedure for Collecting Volatile Soil Samples

1. Open the split spoon.
2. Open the Encore reusable package and remove the core device and cap.
3. Place into the T-handle and directly core the soil sample as it is presented from the open split spoon.
4. Remove from the soil, brush off the sides, and put the cap seal onto the sampler.
5. Label and reseal in the original package.
6. Place into cooler for shipment.

### 3.2.2 Procedure for Collecting Non-Volatile Soil Samples

1. Remove at least 2 inches from each end of the split-spoon coring, collect the soil into a stainless steel bowl.
2. Homogenize the sample by the quartering techniques using the stainless-steel spoon.
3. Fill the appropriate sample jars approximately three-fourths full with the homogenized sample
4. Close the jar, label, and package the sample for shipment to the lab.

A Navy Level C Quality Control and CCI Level C data package will be required along with appropriate Quality Control samples for the required groundwater and air analyses. All analytical data will be submitted by both hard copy and electronic files.

## 3.3 Air Sampling

Air samples will be collected at each sample port on the five SRS units in accordance with Table 3-2 daily during start-up and weekly during the pull testing. These samples will be collected according to the following procedure for Tedlar Bag Sampling

1. Connect a piece of 0.25- inch Teflon tubing to the sample port
2. Connect the other end of the Teflon tubing to the air pump and from the air pump to the Tedlar bag.

3. Open the valve on the bag and fill the bag using the air pump.
4. Close the valve on the Tedlar bag.
5. Disconnect tubing.
6. Label and package the bag for shipment to the laboratory.

## 3.4 Waste Characterization and Incidental Wastestream Sampling and Analyses

Waste characterization samples will be collected to evaluate the handling, transportation, and disposal requirements of any contaminated soil accumulated during SRS installation activities. Soil samples will be collected as described in the following paragraphs, delivered to a Navy-, USACE-, or AFCEE-approved and FDEP-certified laboratory, and analyzed for the parameters listed in Table 3-2.

Soil characterization samples will be collected from the drums or roll-off containers prior to disposal. One composite sample will be collected per six drums or one per roll-off or as required by the disposal facility. A minimum of five grab samples per roll-off or six grab samples from each of six drums will be composited to characterize the material for disposal. For roll-off sampling, the five locations will be selected such that each location is representative of approximately one-fifth of the volume to be disposed of. The roll-off samples will be collected as follows:

1. Choose five random points within the roll-off prior to sampling.
2. At each of the five points, collect grab samples by augering down to a depth that is approximately one-half the depth of the soil staged and collect the sample into a stainless-steel bowl.
3. Homogenize the five grab samples by the quartering techniques using the stainless-steel spoon.
4. Fill the appropriate sample jars approximately three-fourths full with the homogenized sample
5. Close the jars, label, and package the sample for shipment to the lab.

Drums may be used to collect the drill cuttings if soil volume is low. Drums will be sampled according to the following procedure:

1. Bore down drum approximately 6 to 12 inches and fill volatile sample container. Container must be packed and have no headspace.
2. Continue to collect several spoonfuls of the soil into a stainless-steel bowl.
3. Homogenize the sample by the quartering techniques using the stainless-steel spoon.
4. Fill the appropriate sample jars approximately three-fourths full with the homogenized sample.

5. Close the jars, label, and package the samples for shipment to the lab.

A Navy Level B Quality Control and CCI Level B package will be required along with appropriate Quality Control samples for the required waste characterization and incidental waste stream samples. All analytical data will be submitted by both hard copy and electronic files.

## 3.5 Water Characterization

Waste characterization samples will be collected to evaluate the handling, transportation, and disposal requirements of generated water. Water samples will be collected as described in the following paragraphs and delivered to a Navy-, USACE-, or AFCEE-approved and FDEP-certified laboratory, and analyzed for the parameters listed on Table 3-2.

A sample will be collected from the drums using either a dip jar or bailer. The sample containers for volatiles analyses will be filled first. The 40-milliliter (ml) vials will be filled so that there is no headspace in each vial. The sample containers for the remaining analyses will then be filled.

A Navy Level B Quality Control and CCI Level B package will be required along with appropriate Quality Control samples for the required waste characterization and incidental waste stream samples. All analytical data will be submitted by both hard copy and electronic files.

## 3.6 Analytical Methods

### 3.6.1 Analytical Methods

Samples will be collected for the analytical methods summarized in Table 3-2.

### 3.6.2 Analytical Quality Control

QC and minimum reporting or practical quantitation limit requirements are specified in Tables 3-3 through 3-6.

# 4.0 Environmental Protection Plan

The Environmental Protection Plan of the Basewide Work Plan addresses general procedures that will be implemented to prevent pollution and protect the environment during the Site 4 Pilot Study remediation activities at NAS Whiting Field (CCI, 1999).

# 5.0 Waste Management Plan

The scope of this work plan addendum includes the management and disposal of wastes that will be generated during well installation activities and operation of a pilot soil treatment program at Site 4, North AVGAS Tank Sludge Disposal Area, NAS Whiting Field, to address petroleum contamination associated with AVGAS storage tanks.

## 3.1 Wastestreams

It is anticipated that the following wastes will be generated during this activity:

- Contaminated environmental media generated from well installation activities (e.g., drill cuttings). It is anticipated that these media will primarily contain petroleum-related contaminants such as benzene, and poly-aromatic hydrocarbons.
- Wastewater from decontamination activities.
- Clean and uncontaminated construction debris. Debris includes discarded materials generally considered to be not water soluble, including but not limited to concrete, asphalt material, pipe, and materials used in decontamination (e.g., plastic sheeting and personal protective clothing).

Wastes will be characterized according to the Sampling and Analysis Plan, and consistent with the Basewide Waste Management Plan included in the Basewide Work Plan (CCI, 1999). Waste characterization information will typically be included on a waste profile form provided by the offsite facility. CCI will provide analytical data from the most recent characterization sampling and analysis event. However, in some cases, facilities permitted to accept a specific waste material might require specific or additional analyses to evaluate the wastestream prior to acceptance.

## 5.2 Waste Handling

Wastestreams will be segregated as appropriate to prevent the spread of contamination. Contaminated soil will be placed in stockpiles, in 55-gallon drums, or directly loaded into roll-off boxes. Liquid wastes, including decontamination water, will be pumped directly into drums or portable tanks, sampled and analyzed, and transported off-site to the appropriate facility or stored at an area designated by CCI. PPE and other debris will be placed in drums or in roll-off boxes of contaminated soil (as appropriate), characterized (using analysis and/or process knowledge) and hauled to an off-site facility. Uncontaminated debris will be collected daily, segregated, containerized or placed in stockpiles prior to offsite transportation.

### 5.2.1 Waste Storage Time Limits

Wastes will be securely stored onsite prior to transportation and offsite treatment or disposal in roll-off boxes, stockpiles, containers, and portable tanks. **Hazardous wastes will only be stored onsite for less than 90 days, as required under 40 CFR 262.** Containers and tanks of hazardous wastes will be stored in a temporary accumulation area designated by the Navy. If the Navy has not designated an accumulation area, CCI will temporarily store hazardous wastes in a secure area. **Additionally, as required under F.A.C. 62-770, petroleum-contaminated soil (including excessively contaminated soil) will not be stored or stockpiled on-site for more than 60 days. Petroleum-contaminated soil (including excessively contaminated soil) may be containerized in watertight drums and stored onsite for 90 days.**

### 5.2.2 Container Labels

Waste containers, including 55-gallon drums, tanks, and roll-off boxes, will be labeled in accordance with 49 CFR 172, 173 and 178. Labels will include the type of waste, location from which the waste was generated, and accumulation start date. Drums, roll-off boxes, and tanks used to store/accumulate waste will be labeled as follows:

- "Analysis Pending" – until analytical results are received and reviewed, these pre-printed labels will be used unless waste is known to be hazardous (e.g., listed hazardous wastes). This label will include the accumulation start date.
- "Hazardous Waste" – for hazardous wastes, pre-printed hazardous waste labels will be used and will include the following information:
  - Accumulation start date
  - Generator Name: U.S. Navy
  - USEPA ID number for site
  - Waste codes
  - Manifest number (mandatory for containers of less than 110 gallons)
- "Non-Hazardous Waste" - for non-hazardous wastes verified by analytical data and/or process knowledge, preprinted labels will be used and will include the following information:
  - Accumulation start date
  - Generator Name: U.S. Navy
  - USEPA ID Number
  - Waste-specific information (e.g., contaminated soil)

Where applicable, the major hazards on the label (e.g., flammable, oxidizer, and carcinogen) will be included on the label.

### 5.2.3 Waste Storage Areas

Roll-off boxes, containers, and tanks of hazardous wastes will be stored in a temporary accumulation area designated by the Navy. If the Navy has not designated an accumulation area, CCI will temporarily store hazardous wastes in a secure area (such as within a fenced, barricaded, or cordoned area).

Waste storage areas will contain emergency equipment equivalent to hazard posed by waste. Hazardous waste storage areas will include fire extinguishers (in areas where wastes are known or suspected to be flammable or ignitable), decontamination equipment, and an alarm system (if radio equipment is not available to all staff working in storage area). **Spill control equipment (e.g., sorbent pads) will be available in hazardous waste storage areas, and where liquids are transferred from one vessel to another.**

### Drums/Small Containers

- Drums and small containers of waste will be maintained in temporary accumulation areas. Drum of hazardous waste or liquid waste will be stored on wood pallets.
- Drums will be inspected and inventoried upon arrival onsite for signs of contamination and/or deterioration.
- A row of drums should be no more than 2 drums wide. Adequate aisle space (e.g., 30 inches) will be provided between rows to allow the unobstructed movement of personnel and equipment.
- Each drum will be provided with its own label.
- Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday.
- Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated prior to re-use or before leaving the site.
- Secondary containment will be provided for drums of liquid hazardous waste or hazardous wastes that are incompatible with other wastes or materials stored nearby.

### Portable Tanks

- Tanks will be inspected upon arrival onsite for signs of deterioration and contamination. Any tank arriving onsite with contents will be rejected.
- Tanks will be provided with covers.
- Each tank will be labeled.
- Tanks containing hazardous waste or incompatible liquids will be provided with secondary containment.

### Stockpiles

The following procedures will be followed when stockpiling soils:

- Stockpiles will be placed on plastic sheeting near the excavation areas and within the area of contamination.

- Stockpiles will be provided with liner and perimeter berm to prevent rupture and release or infiltration of liquids. Covers will be provided as necessary to prevent storm water run-on and run-off during significant storm events, and to prevent wind dispersion.
- Minimum 6-mil polyethylene sheeting will be used for liners and covers.
- The perimeter berm, typically hay bales placed beneath the liner, will be constructed to allow for collection of any free liquids draining from the stockpile.
- Accumulated free liquids will be pumped (or otherwise removed) to a container.

- Covers and perimeter berms will be secured in-place when not in use and at the end of each workday, or as necessary to prevent wind dispersion or run-off from major storm events.
- Construction materials for the stockpiles that contact waste will be disposed of as contaminated debris.
- A log documenting accumulation dates will be maintained for soils and other waste stored onsite in stockpiles.

### Roll-off Boxes

- Roll-off boxes will be inspected upon arrival on-site. Any roll-off containers arriving with contents will be rejected.
- Roll-off boxes for hazardous and excessively contaminated soils will be provided with covers and disposable liners. Liners will be disposed of as contaminated debris.
- When not in use, securely fastened covers will be installed on all roll-off boxes.
- Old labels will be removed and each roll-off box will be labeled.
- Roll-off containers will be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure.

## 5.2.4 Inspections

Areas used for waste/container storage will be inspected for malfunctions, deterioration, discharges, and leaks that could result in a release. The following inspection schedule will be followed:

- Daily inspection of containers, tanks and roll-off boxes (for leaks, signs of corrosion, or signs of general deterioration).
- Daily inspection of stockpiles (for liner and berm integrity).
- Daily inspection of fuel storage areas (e.g., look for eroding containment systems and rusting tanks/ancillary equipment)

**Inspections will be recorded on the Daily Production Report.**

## 5.3 Waste Transportation and Disposal

### 5.3.1 Waste Transportation

Each vehicle transporting waste will be inspected before leaving the site. The quantities of waste leaving the site will be recorded. A licensed, commercial transporter will transport non-hazardous wastes. Hazardous waste transporters will be licensed in accordance with 49 CFR 171-179. A copy of the documentation indicating that the selected transporter has appropriate licenses will be received prior to transport of any waste.

Small containers such as 55-gallon drums that are transported onsite or offsite will either be placed on pallets or loaded directly using a drum handler designed to lift 55-gallon drums. Containers will be secured prior to loading a pallet onto a vehicle (e.g., secured together with non-metallic bonding). Similarly, once containers are loaded on a vehicle, they will be secured (e.g., tie-down straps) to prevent shifting or any other condition that would cause damage to a container.

For large containers or roll-off boxes, the transporter will be responsible for weighing loads at a certified scale. For each load of material, weight measurements will be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities will be based on the difference of weight measurements between the full and empty container, dump truck, or tanker truck. Weights will be recorded on the waste manifest. The transporter will provide copies of weight tickets with the final manifest.

Except for uncontaminated construction debris, each load of waste will be manifested prior to leaving the site. **All required transportation manifests will be prepared by CCI and signed by an NAS Whiting Field representative.** A bill of lading and weight ticket will be prepared for the transportation of uncontaminated construction debris.

The manifest form, with multiple carbon copies, will typically be provided by the waste transporter or selected treatment or disposal facility. The manifest will accompany the waste material to its final destination. If the waste is hazardous, the manifest will be completed in accordance with 40 CFR 262. The treatment, disposal, or recycling facility will be responsible for providing a copy of the final waste manifest and for providing a certificate of treatment or disposal for each load of waste received.

**If the signed hazardous waste manifest from the designated offsite facility is not received within 35 days, CCI will contact the transporter or the designated facility to determine the status of the waste. If the signed hazardous waste manifest has not been received within 45 days, CCI will issue an "Exception Report" to the state of Florida, as required under 40 CFR 262.42 (as adopted under FAC 62-730).**

At a minimum, the non-hazardous or hazardous manifest form will include the following information:

- Transporter information including name, address, contact and phone number
- Generator information including name, address, contact, and phone number
- Site name including street/mailing address
- Description of waste including reference to characterization form if available
- Type of container
- Quantity of waste (volumetric estimate)

Additionally, each waste stream transported offsite will also have a waste profile, Land Disposal Restriction Notifications/Certifications (for hazardous wastes), and a haul ticket.

Transportation of wastes will be inventoried the day of transportation from the site using the Transportation & Disposal Log. A carbon copy of the initial manifest form for each load will be retained on-site and attached to the Daily Production Report.

The following procedures are observed when hauling and transporting wastes:

- Minimize impacts to general public traffic
- Repair road damage caused by construction and/or hauling traffic
- Cleanup material spilled in transit
- All personnel involved in offsite disposal activities will follow safety and spill response procedures outlined in the Health and Safety Plan
- No materials from other projects will be combined with materials from NAS Whiting Field

### 5.3.2 Disposal

Non-hazardous wastes, including wastewater, will be transported to facilities specifically permitted by the state under FAC 62-701. The following wastes will be disposed at facilities specifically permitted to accept these wastes (as described by Florida regulations):

- Petroleum-contaminated soil will be disposed of in **permitted, lined** landfills (FAC 62-701.520)
- Construction debris will be disposed in a landfill permitted to accept these wastes (FAC 62-701.730).
- Hazardous wastes will be sent to a facility permitted to treat, store, or dispose of hazardous wastes under (FAC 62-730).

## 5.4 Recordkeeping

The following records and documents will be maintained:

- Transportation and offsite disposal records, including:
  - Profiles and associated characterization data
  - Manifests, bills of lading, LDR notifications, and other shipping records
  - Offsite facility waste receipts
- Training record
- Inspection records
- Material Data Safety Sheets (MSDS) for chemicals brought onsite

# 6.0 Quality Control Plan

The Quality Control Plan provided in the Basewide Work Plan details the quality administrators, the project organization for the work to be completed at NAS Whiting Field, and the definable features of work for each project site.

The Submittal Register included in Appendix C of this work plan addendum, documents submittals in accordance with Appendix B of CCI's Contract Management Plan (dated July 1998). CCI, the Navy, or others will approve submittals as identified in the Submittal Register. All approved submittals will be distributed by CCI to the appropriate Navy personnel (Contracting Officer [CO], Resident Officer in Charge of Construction [ROICC] (in duplicate), etc.), the project site, and to the job file.

The site-specific project organization chart, provided as Figure 6-1, depicts the chain-of-command for this CTO and the individuals responsible for executing the work as indicated. Roles and responsibilities are summarized in Table 6-1.

## 6.1 CTO Project QC Manager

Mr. Arnold Lee Ridley will serve as Project QC Manager.

## 6.2 Testing Requirements

This section identifies environmental sample analysis laboratories and their certifications, environmental sampling and analysis, test control, and construction testing laboratories and their certifications.

### 6.2.1 Identification and Certification of Testing Laboratories

The laboratories utilized for this CTO project will function as a subcontractor in some cases and in other cases will function as a lower tier subcontractor. These laboratories have not yet been identified.

### 6.2.2 Construction

Construction testing laboratories will be National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), American Association of State Highways and Transportation Officials (AASHTO), or American Association of Laboratory Accreditation (AALA) accredited.

### 6.2.3 Environmental

Laboratories used for analysis of environmental samples will be Navy and FDEP-approved, and have an FDEP-approved CompQAP.

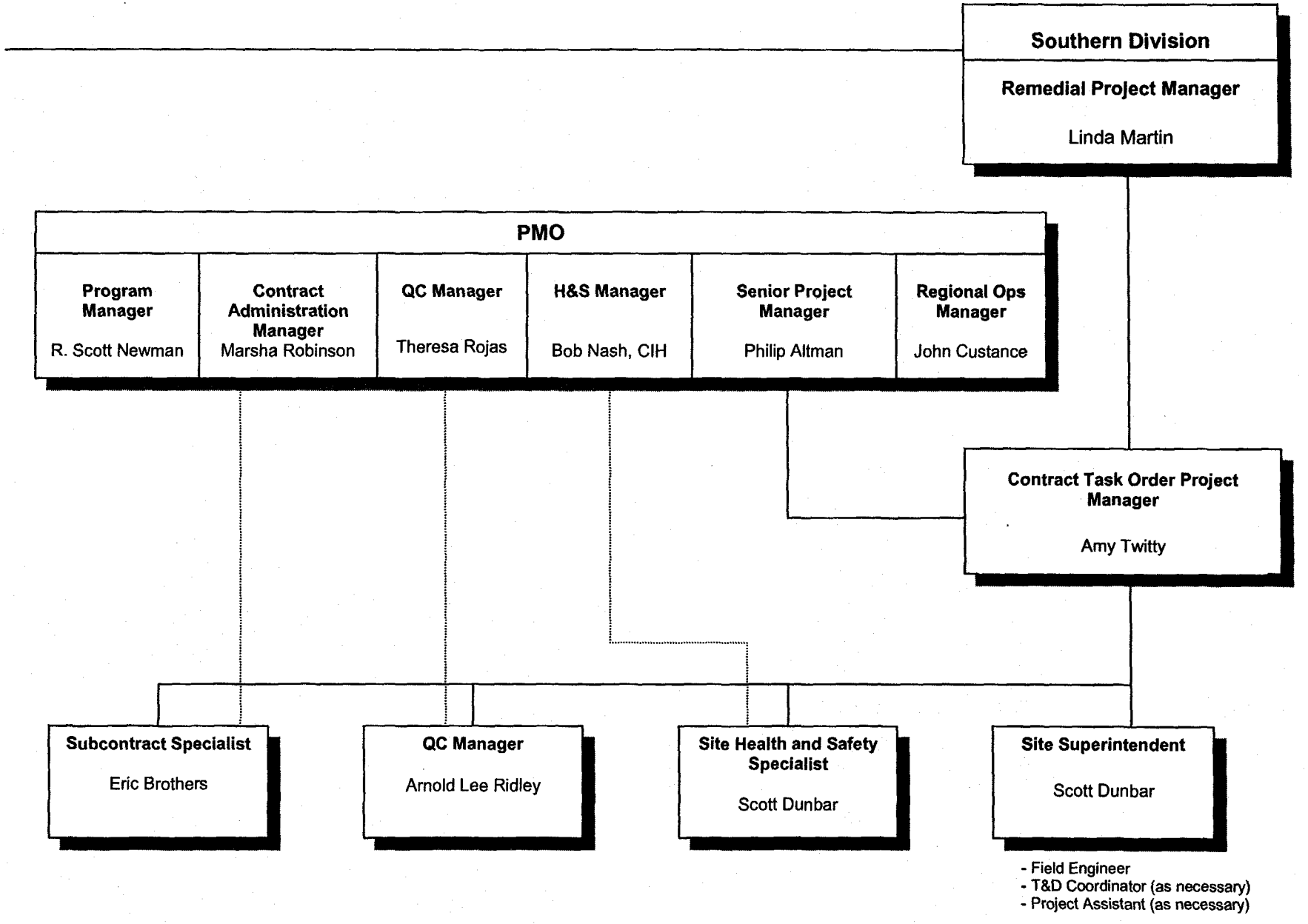




**Figure 6-1**
Project Organization Chart

**TABLE 6-1**
Roles, Responsibilities, and Authorities of Individuals Assigned to a CTO

| Role | Responsibility | Authority |
|---|---|---|
| Project Manager | • Management and Technical Direction of work<br>• Communication with Southern Division RPM and NTR<br>• Overview subcontractor performance<br>• Select CTO staff<br>• Develop CTO Work Plan and supporting plans<br>• Meet CTO Performance Objectives<br>• Prepare status reports | • Approve subcontractor selection<br>• Approve invoices to Southern Division<br>• Approve CTO baseline schedule<br>• Stop work at the site for any reason<br>• Approve payment to vendors and suppliers<br>• Approve payment to subcontractors |
| Site Superintendent | • Responsible for all site activities<br>• Provide direction to subcontractors<br>• Act for Project Manager<br>• Provide daily status reports<br>• Prepare CTO Work Plan<br>• Conduct daily safety meetings<br>• Review subcontractor qualifications<br>• Stop work for unsafe conditions or practices | • Stop work for subcontractors<br>• Approve corrective action for site work-arounds<br>• Approve materials and labor costs for site operations<br>• Resolve subcontractor interface issues<br>• Approve daily and weekly status reports |
| Resident Engineer | • Monitor and oversee subcontractor compliance with scope of work<br>• Review requests for changes in scope o9f work<br>• Review technical qualifications of subcontractors<br>• Prepare Field Change Requests<br>• Respond to Design Change Notices<br>• Recommend improvements in work techniques or metrics<br>• Recommend work-around to Site Superintendent | • Approve Field Change Requests below ceiling amount<br>• Complete daily compliance report |

**TABLE 6-1 (CONTINUED)**
Roles, Responsibilities, and Authorities of Individuals Assigned to a CTO

| Role | Responsibility | Authority |
|---|---|---|
| Project Assistant | • Maintain CTO files and correspondence<br>• Coordinate CTO schedule and monitor deliverables<br>• Maintain change management records<br>• Maintain Action Tracking System log | • Submit Action Tracking System log<br>• Assign correspondence log numbers |
| Project QC Manager | • Monitor and report on subcontractor quality and quantities<br>• Audit subcontractors offsite fabrication<br>• Maintain Submittal Register<br>• Participate in Continuous Improvement Team<br>• Stop work for non-compliant operations<br>• Maintain Lessons Learned Log | • Stop work for non-compliant operations<br>• File daily quantities report<br>• File Lessons Learned Log Sheet<br>• Approve resumption of work for resolved quality issues |
| Site Health and Safety Specialist | • Monitor and report on subcontractor safety and health performance<br>• Record and report safety statistics<br>• Conduct needed site safety and health orientation<br>• Maintain Environmental Log<br>• Stop work for unsafe practices or conditions | • Stop work for unsafe practices or conditions<br>• Approve subcontractor site specific health and safety plan<br>• Set weekly safety objectives<br>• Approve resumption of work for resolved safety issues |
| Subcontract Specialist | • Prepare bid packages<br>• Purchase disposable materials<br>• Maintain subcontract log | |

### 6.3.4 Environmental Sampling and Analysis

Environmental sampling and analysis, including QC sampling and analysis, is specified in the project Sampling and Analysis Plan, Section 3.0 of this CTO Work Plan Addendum. Samples will be collected in accordance with USEPA methods, FDEP standards, and industry standards of practice.

### 6.3.5 Test Control

Environmental samples will be collected in accordance with FDEP and USEPA methods and procedures. Other controls will include, but are not limited to, maintaining a chain of custody; proper handling, packing, and shipping; and the use of qualified laboratories.

## 6.4 CTO Support Organizations

The supporting organizations are yet to be determined.

# 7.0 Works Cited

Bechtel National, Inc., Bechtel's Solar Remediation System - The Clean Alternative, 1999.

CH2M HILL Constructors, Inc., Basewide Work Plan Naval Air Station Whiting Field, Milton, Florida, revision No. 00, November 1999.

Tetra Tech NUS, Remedial Investigation Report for Surface and Subsurface Soil Sites 3, 4, 6, 30, 32, and 33, Naval Air Station Whiting Field, Milton, Florida, September 1999.

Tetra Tech NUS, Feasibility Study for Surface and Subsurface Soil at Sites 3, 4, 6, 30, 32, and 33, Naval Air Station Whiting Field, Milton, Florida, October 1999

# Appendix A

# Health and Safety Plan

# Health and Safety Plan
# Solar Remediation System Pilot Study
# Site 4 – North AVGAS Tank Sludge Disposal
# Naval Air Station Whiting Field
# Milton, Florida

**Revision No. 00**

## Contract No. N62467-98-D-0995
## Contract Task Order No. 0011

**Submitted to:**

## U.S. Naval Facilities
## Engineering Command
## Southern Division

**Prepared by:**

**CH2MHILL**
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Atlanta, GA 30346

**August 2000**

# Contents

## Attachments



## Figures



## Tables

## Tables Continued

# Acronyms

| | |
|---|---|
| °F | degrees Fahrenheit |
| ALARA | as low as reasonably achievable |
| APR | air-purifying respirator |
| ATL | Atlanta |
| CCI | CH2M HILL Constructors, Inc. |
| CNS | central nervous system |
| CPR | cardiopulmonary resuscitation |
| CTO | Contract Task Order |
| dBA | decibel A-rated |
| DOT | Department of Transportation |
| EPA | U. S. Environmental Protection Agency |
| FA | first aid |
| FID | flame ionization detector |
| GFCI | ground fault circuit interrupter |
| HAZCOM | hazard communication |
| HAZWOPER | hazard waste operations and emergency response |
| HR | heart rate |
| HSM | Health and Safety Manager |
| HSP | Health and Safety Plan |
| IDLH | immediately dangerous to life and health |
| IDW | investigation-derived waste |
| lb | pound |
| LEL | lower explosive limit |
| $mg/m^3$ | milligrams per cubic meter |
| MSDS | Material Safety Data Sheet |
| $mW/cm^2$ | milliwatt per square centimeter |
| NAS | Naval Air Station |
| NDG | nuclear density gauge |
| NSC | National Safety Council |
| OSHA | Occupational Safety and Health Administration |
| PAPR | powered air-purifying respirator |
| PDF | personal flotation device |
| PID | photoionization detector |
| PPE | personal protective equipment |
| ppm | parts per million |
| RMSF | Rocky Mountain Spotted Fever |
| SAR | supplied-air respirator |
| SCBA | self-contained breathing apparatus |
| SHSS | Site Health and Safety Specialist |
| SOP | standard of practice |
| STEL | short-term exposure limit |
| SZ | support zone |

| | |
|---|---|
| TBD | to be determined |
| TMCC | truck-mounted crash cushion |
| TSDF | treatment, storage, and disposal facility |
| TSDF | treatment, storage, and disposal facility |
| VOC | volatile organic compound |

This health and safety plan (HSP) will be kept on the site during field activities and will be reviewed and updated as necessary. The plan adopts, by reference, the standards of practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* and CH2M HILL Constructors, Inc. (CCI) Health and Safety Guidelines as appropriate. The Site Health and Safety Specialist (SHSS) is to be familiar with these SOPs and the content of this plan. Site personnel must sign Attachment 1. In addition, this plan adopts procedures in the work plan for the project.

# 1.0 Project Information and Description

**Client or Owner:** Southern Division, Navy RAC

**Project No:** 152170

**CCI Project Manager:** John Custance

**Office:** Atlanta, Georgia (ATL)

**Site Name:** Naval Air Station (NAS) Whiting Field

**Site Address:** Milton, Florida

**Date Health and Safety Plan Prepared:** May 1999

**Date(s) of Initial Visit:** March 1999

**Date(s) of Site Work:** May through December 1999

**Site Access:** Access is through the Main Gate off USS Enterprise Street. Base security can be contacted at 850-623-7205.

**Site Size:** NAS Whiting Field is a training base occupying 4700 acres at the main complex and 13 outlying fields. The main facility consists of two separate and distinct airports and control towers.

**Site Topography:** rolling hills (western highlands)

**Prevailing Weather:** hot, humid summers with chance of hurricanes

**Site Description and History:** NAS Whiting Field was commissioned on July 16, 1943, and became a training facility for the Navy. Although the aircraft have changed, the mission/function continues today. The facility is listed on the U.S. Environmental Protection Agency (EPA) National Priority List.

Site 4 is a former underground storage tank (UST) facility located north of Tow Lane at North Field. The site contained eight 23,700-gallon steel USTs, one 15,000-gallon UST and one 750-gallon UST dating back to 1943 when NAS Whiting Field first began operations. Nine USTs were used to store aviation gasoline and one to store contaminated jet fuel. All USTs and associated piping were removed in the mid-1990s. There were no records of spills or leaks, but petroleum contamination was observed when the USTs were removed. The former tank farm covers approximately 2.5 acres and is currently covered with grass.

# 2.0 Project Organization and Tasks to be Performed under this Plan

## 2.1 Project Organization

**Client:** Southern Division, Naval Facilities Engineering Command

CCI:
Project Manager: John Custance/ATL
Field Team Leader: Scott Dunbar/ATL
Refer to Section 4.0 for field staff.
**Contractors and Subcontractors:** Refer to Section 4.2.

## 2.2 Description of Tasks

Refer to project documents (i.e., work plan) for detailed task information. A health and safety risk analysis has been performed for each task and is incorporated in this HSP through task-specific hazard controls and requirements for monitoring and protection. Tasks in addition to those listed below require an approved amendment to this plan before additional work begins. Refer to Section 10.2 for procedures related to tasks that do not involve hazardous waste operations and emergency response (HAZWOPER).

### 2.2.1 HAZWOPER-Regulated Tasks

HAZWOPER-regulated tasks include:

- Drilling, well installation
- Monthly vapor pressure and total volatile organic compounds (VOC) air monitoring

### 2.2.2 Non-HAZWOPER-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state HAZWOPER regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-HAZWOPER-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

| Tasks | Controls |
|---|---|
| • Mechanical installations (equipment, pumps, etc.)<br>• Waste removal/hauling | • Brief on hazards, limits of access, and emergency procedures<br>• Post contamination areas (refer to Section 8.0)<br>• Sample and monitor as appropriate (refer to Section 5.0) |

A task hazard analysis is provided in Table 2-1.

**TABLE 2-1**
Task Hazard Analysis

| Potential Hazards | Tasks | |
|---|---|---|
| | Drilling and Well Installation | Remedial Construction |
| Benzene HS-67 | X | |
| Concrete and Masonry Work HS-43 | X | X |
| Drilling HS-35 | X | |
| Electrical HS-23 | X | X |
| Fire Protection HS-22 | X | X |
| Manual Lifting HS-29 | X | X |
| Noise >85dBa HS-39 | X | X |
| Respiratory Protection HS 08 | X | |

### 2.2.3 Hazard Controls

Table 2-2 lists safe work practices and control measures used to reduce or eliminate potential hazards for the activities associated with this project. Inspection and training requirements for equipment are listed in Table 2-3. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CCI employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CCI employees and subcontractors who do not understand any of these provisions should contact the SHSS for clarification.

In addition to controls specified in this section, activity Self-Assessment Checklist is provided in Attachment 5. This checklist is to be used to assess the adequacy of CCI and subcontractors site-specific safety requirements. Objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing gaps. A Self-Assessment Checklist will be completed weekly and returned to the Senior Project Manager, with a copy to the HSM.

**TABLE 2-2**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Drilling and Well Installation** | | |
| General Hazards | Reduce general safety hazards found at most sites referenced CH2M HILL SOP HS-20 | Site work will be performed during daylight hours whenever possible. Work conducted during hours of darkness will require enough illumination intensity to read a newspaper without difficulty.<br><br>Hearing protection worn in areas where you need to shout to hear someone within 3 feet.<br><br>Good housekeeping must be maintained at all times in project work areas.<br><br>Common paths of travel established and kept free from accumulation of materials.<br><br>Provide slip-resistant surfaces, ropes, and /or other devices to be used.<br><br>Specific areas should be designated for the proper storage of materials.<br><br>Tools, equipment, materials, and supplies will be stored in an orderly manner.<br><br>As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.<br><br>Containers should be provided for collecting trash and other debris and will be removed at regular intervals.<br><br>Spills will be cleaned up. Oil and grease will be cleaned from walking and working surfaces. |
| Hazard Communication | Comply with the Hazard Communication Standard informing worker about the chemical to which they may be exposed referenced 29 CFR 1926 and CH2M HILL SOP HS-05 | Complete an inventory of chemicals brought on site by CCI using the Project-Specific Chemical Hazard Communication Form provided in Attachment 2.<br><br>Confirm inventory of chemicals brought on site by CCI subcontractors is available.<br><br>Confirm locations of Material Safety Data Sheets (MSDSs) from client, contractors, and subcontractors for chemicals to which CCI employees potentially are exposed.<br><br>Before or as the chemicals arrive onsite, obtain an MSDS for each hazardous chemical.<br><br>Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.<br><br>Give employees required chemical-specific HAZCOM training using the Chemical-Specific Tracking Form provided in Attachment 3. |
| Buried utilities, drums, tanks | Reduce risk of contacting buried utilities, drums, or tanks during excavations | Contact local utility locator service or Base utilities service before excavations .<br><br>Perform testing to locate buried tanks, drums or pipelines such as magnetometer or ground penetrating radar survey before excavation. |

**TABLE 2-2 CONTINUED**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Drilling and Well Installation** | | |
| Compressed gasses | Reduce the hazards when working with compressed gasses | Valve caps must be in place when cylinders are transported, moved, or stored.<br><br>Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.<br><br>Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.<br><br>Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.<br><br>Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings. |
| Drilling | Reduce the hazards from drilling operations as referenced in CH2M HILL SOP HS-35 | Only authorized personnel are permitted to operate drill rigs.<br><br>Stay clear of areas surrounding drill rigs during every startup.<br><br>Stay clear of the rotating augers and other rotating components of drill rigs.<br><br>Stay clear of hoisting operations. Loads will not be hoisted overhead of personnel.<br><br>Do not wear loose-fitting clothing or items such as rings or watches that could get caught in moving parts. Long hair should be restrained.<br><br>If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have line de-energized prior to approaching the equipment.<br><br>Smoking around drilling operations is prohibited. |

**TABLE 2-2 CONTINUED**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Drilling and Well Installation** | | |
| Fire Protection | To reduce the incidents of fires and provide resources to fight fires referenced in 29 CFR 1926.150 and CH2M HILL SOP-22 | Fire extinguishers will be provided so travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must: 1) be maintained in a fully charged and operable condition, 2) be visually inspected each month, and 3) undergo a maintenance check each year.<br><br>The area in front of extinguishers must be kept clear.<br><br>Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.<br><br>Combustible materials stored outside should be at least 10 feet from any building.<br><br>Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.<br><br>Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet. |
| Manual Lifting | Reduce hazards encountered when lifting loads as referenced by CH2M HILL SOP HS-29 | Proper lifting techniques must be used when lifting any object.<br><br>Plan storage and staging to minimize lifting or carrying distances.<br><br>Split heavy loads into smaller loads.<br><br>Use mechanical lifting aids whenever possible.<br><br>Have someone assist with the lift especially for heavy or awkward loads.<br><br>Ensure that the path of travel is clear prior to the lift. |
| Noise | Reduce the exposure to noise as referenced by 29 CFR 1926.101 and 29CFR 1910.95, and CH2M HILL SOP HS-39 | Noise areas will be evaluated at the start of the project and at any time new machinery is added to the process.<br><br>Hearing protection will be worn whenever levels in excess of 85 dBA are exceeded as in areas where you must raise your voice to communicate at a distance of 3 feet or less.<br><br>Personnel will be trained in the proper installation techniques for ear protection that fits in the ear canal.<br><br>Hearing protective devices will be kept clean and sanitary be between uses.<br><br>Noise measurements may be required by the SSHS to determine protection areas. These areas need to be posted with appropriate warning signs. |

**TABLE 2-2 CONTINUED**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Drilling and Well Installation** | | |
| Respiratory Protection | Perform respiratory protection in a safe and healthful manner reference 29 CFR 1926.103 and CH2M HILL SOP HS-0 | Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR).<br><br>Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used.<br><br>Tight-fitting facepiece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months.<br><br>Respirator use will be limited to those activities identified in this plan. If site conditions change that alter the effectiveness of the specified respiratory protection, the HSM will be notified to amend the written plan.<br><br>Tight-fitting facepiece respirator users will be clean-shaven and will perform a user seal check before each use.<br><br>Canisters/cartridges will be replaced according to change-out schedule specified in this plan. Respirator users will notify SHSS of any detection of vapor or gas breakthrough.<br><br>SHSS will report any breakthrough events to HSM for schedule upgrade.<br><br>Respirators in regular use will be inspected before each use and during cleaning<br><br>Respirators in regular use will be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition.<br><br>Respirators will be properly stored to protect against contamination and deformation.<br><br>Field repair of respirators will be limited to routine maintenance. Defective respirators will be removed from service.<br><br>When breathing air is supplied by cylinder or compressor, the SHSS will verify the air meets Grade D air specifications.<br><br>The SHSS will complete the H&S Self-Assessment Checklist – Respiratory Protection include in Attachment 5 of this plan to verify compliance with CH2M HILL's respiratory protection program. |

**TABLE 2-2 CONTINUED**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Monthly Vapor Pressure and VOC Monitoring** | | |
| General Hazards | Reduce general safety hazards found at most sites referenced CH2M HILL SOP HS-20 | Site work will be performed during daylight hours whenever possible. Work conducted during hours of darkness will require enough illumination intensity to read a newspaper without difficulty.<br><br>Hearing protection worn in areas where you need to shout to hear someone within 3 feet.<br><br>Good housekeeping must be maintained at all times in project work areas.<br><br>Provide slip-resistant surfaces, ropes, and /or other devices to be used.<br><br>Specific areas should be designated for the proper storage of materials.<br><br>Tools, equipment, materials, and supplies will be stored in an orderly manner.<br><br>Containers should be provided for collecting trash and other debris and will be removed at regular intervals.<br><br>Spills will be quickly cleaned up. Oil and grease will be cleaned from walking and working surfaces. |
| Hazard Communication | Comply with the Hazard Communication Standard informing worker about the chemical to which they may be exposed referenced 29 CFR 1926 and CH2M HILL SOP HS-05 | Complete an inventory of chemicals brought on site by CCI using the Project-Specific Chemical Hazard Communication Form provided in Attachment 2.<br><br>Confirm inventory of chemicals brought on site by CCI subcontractors is available.<br><br>Confirm locations of Material Safety Data Sheets (MSDSs) from client, contractors, and subcontractors for chemicals to which CCI employees potentially are exposed.<br><br>Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.<br><br>Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.<br><br>Give employees required chemical-specific HAZCOM training using the Chemical-Specific Tracking Form provided in Attachment 3. |

**TABLE 2-2 CONTINUED**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Monthly Vapor Pressure and VOC Monitoring** | | |
| Fire Protection | To reduce the incidents of fires and provide resources to fight fires referenced in 29 CFR 1926.150 and CH2M HILL SOP-22 | Set-up personal fall arrest systems so that you can neither free-fall more than 6 feet nor contact any lower level.<br>Fire extinguishers will be provided so travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must: 1) be maintained in a fully charged and operable condition, 2) be visually inspected each month, and 3) undergo a maintenance check each year.<br>The area in front of extinguishers must be kept clear.<br>Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.<br>Combustible materials stored outside should be at least 10 feet from any building.<br>Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.<br>Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet. |
| Manual Lifting | Reduce hazards encountered when lifting loads as referenced by CH2M HILL SOP HS-2 | Proper lifting techniques must be used when lifting any object.<br>Plan storage and staging to minimize lifting or carrying distances.<br>Split heavy loads into smaller loads.<br>Use mechanical lifting aids whenever possible.<br>Have someone assist with the lift especially for heavy or awkward loads.<br>Ensure that the path of travel is clear prior to the lift. |
| Noise | Reduce the exposure to noise as referenced by 29 CFR 1926.101 and 29CFR 1910.95, and CH2M HILL SOP HS-39 | Noise areas will be evaluated at the start of the project and at any time new machinery is added to the process.<br>Hearing protection will be worn whenever levels in excess of 85 dBA are exceeded as in areas where you must raise your voice to communicate at a distance of three feet or less.<br>Personnel will be trained in the proper installation techniques for ear protection that fits in the ear canal.<br>Hearing protective devices will be kept clean and sanitary be between uses.<br>Noise measurements may be required by the SSHS to determine protection areas. These areas need to be posted with appropriate warning signs. |

**TABLE 2-2 CONTINUED**
Activity Hazard Analysis

| Principal Steps | Potential Safety/Health Hazards | Recommended Controls |
|---|---|---|
| **Monthly Vapor Pressure and VOC Monitoring** | | |
| Respiratory Protection | Perform respiratory protection in a safe and healthful manner reference 29 CFR 1926.103 and CH2M HILL SOP HS-08 | Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR).<br><br>Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used.<br><br>Tight-fitting facepiece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months.<br><br>Respirator use will be limited to those activities identified in this plan. If site conditions change that alter the effectiveness of the specified respiratory protection, the HSM will be notified to amend the written plan.<br><br>Tight-fitting facepiece respirator users will be clean-shaven and will perform a user seal check before each use.<br><br>Canisters/cartridges will be replaced according to change-out schedule specified in this plan. Respirator users will notify SHSS of any detection of vapor or gas breakthrough. SHSS will report any breakthrough events to HSM for schedule upgrade.<br><br>Respirators in regular use will be inspected before each use and during cleaning.<br><br>Respirators in regular use will be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition.<br><br>Respirators will be properly stored to protect against contamination and deformation.<br><br>Field repair of respirators will be limited to routine maintenance. Defective respirators will be removed from service.<br><br>When breathing air is supplied by cylinder or compressor, the SHSS will verify the air meets Grade D air specifications.<br><br>The SHSS will complete the H&S Self-Assessment Checklist – Respiratory Protection include in Attachment 5 of this plan to verify compliance with CH2M HILL's respiratory protection program. |

**TABLE 2-3**
Equipment Inspection and Training Requirements

| Equipment To Be Used | Inspection Requirements | Training Requirements |
|---|---|---|
| Trackhoes<br>Backhoes<br>Excavators<br>Bucket Cranes<br>Bull Dozers<br>HS-27 | Maintain safe distance from operating equipment and stay alert of equipment movement. Avoid positioning between fixed objects and operating equipment and equipment pinch points, remain outside of equipment swing/turning radius. Pay attention to backup alarms, but not rely on them for protection. Never turn your back on operating equipment.<br><br>Approach operating equipment only after receiving the operator's attention. The operator will acknowledge your presence and stop movement of the equipment. Caution will be used when standing next to idle equipment; when equipment is placed in gear it can lurch forward or backward. Never approach operating equipment from the side or rear where the operator's vision is compromised.<br><br>When required to work in proximity to operating equipment, wear high-visibility vests to increase visibility to equipment operators. For work performed after daylight hours, vests will be made of reflective material or include a reflective stripe or panel.<br><br>Do not ride on earthmoving equipment unless it is specifically designed to accommodate passengers. Only ride in seats that are provided for transportation and that are equipped with seat belts.<br><br>Earthmoving equipment will not be used to lift or lower personnel.<br><br>If equipment becomes electrically energized, personnel will be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party will be contacted to have line de-energized prior to approaching the equipment. | Only authorized and trained personnel are permitted to operate earthmoving equipment. |
| Motor Vehicles (Off highway job site) HS-47 | All vehicles will have working safety equipment including: two headlights, brake lights, audible warning device, and a reverse signal audible above surrounding noise levels.<br><br>Cabs shall be equipped with windshields and powered wipers.<br><br>All vehicles in use will be inspected at the beginning of each shift and a CCI Heavy Equipment Checklist completed (or the subcontractor's equivalent document.) | Only state licensed personnel may operate company vehicles. |

# 3.0 Hazard Evaluation and Control

## 3.1 Heat Stress

*Reference CH2M HILL SOP HS-09, Heat and Cold Stress*

### 3.1.1 Preventing Heat Stress

The following guidelines relate to heat stress prevention:

- Drink 16 ounces of water before beginning work, such as in the morning or after lunch. Disposable (e.g., 4-ounce) cups and water maintained at 50 to 60 degrees Fahrenheit (°F) should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, preferably air-conditioned, area. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours. Monitor for signs of heat stress.
- Acclimate to site work conditions by slowly increasing workloads; e.g., do not begin site work with extremely demanding activities.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. The devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- During hot weather, conduct field activities in the early morning or evening if possible.
- Provide adequate shelter to protect personnel against radiant heat (sun, flames, hot metal), which can decrease physical efficiency and increase the probability of heat stress.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequently changing clothing and by showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.

### 3.1.2 Symptoms and Treatment of Heat Stress

The symptoms of heat stress are listed in Table 3-1.

TABLE 3-1
Symptoms and Treatment of Heat Stress

| | Heat Syncope | Heat Rash (*miliaria rubra*, "prickly heat") | Heat Cramps | Heat Exhaustion | Heat Stroke |
|---|---|---|---|---|---|
| Signs and Symptoms | Sluggishness or fainting while standing erect or immobile in heat. | Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure. | Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours. | Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low | Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature. |
| Treatment | Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete. | Use mild drying lotions and powders, and keep skin clean for drying skin and preventing *infection*. | Remove to cooler area. Rest lying down. Increase fluid intake. | Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention. | Cool rapidly by soaking in cool–but not cold–water. Call ambulance, and get medical *attention* immediately! |

### 3.1.3 Heat-Stress Monitoring

For field activities part of ongoing site work activities in hot weather, the following procedures should be used to monitor the body's physiological response to heat and to estimate the work-cycle/rest-cycle when workers are performing moderate levels of work. These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (greater than 50 percent), or when the workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute, or 20 beats per minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats per minute, or 20 beats per minute above resting pulse.

## 3.2 Locating Buried Utilities

### 3.2.1 Local Utility Mark-Out Service

The Base Civil Engineer will be responsible for marking utilities.

### 3.2.2 Procedures for Locating Buried Utilities

Procedures for locating buried utilities are listed as follows:

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural-gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary, clear locations with a utility-locating instrument (e.g., metal detector).
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually. Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SHSS should confirm that arrangement.

## 3.3 Biological Hazards and Controls

Biological hazards and controls are listed in Table 3-2.

**TABLE 3-2**
Biological Hazards and Controls

| Hazard and Location | Control Measures |
|---|---|
| **Snakes** typically are found in underbrush and tall grassy areas. | If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the type of snake: note color, size, patterns, and markings. |
| **Poison ivy, poison oak, and poison sumac** typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. | Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention. |
| Exposure to **bloodborne pathogens** may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material, or when coming into contact with landfill waste or waste streams containing such infectious material. | Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility. |
| **Bees and other stinging insects** may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. | Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SHSS and/or the buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops. |
| **Other potential biological hazards** | None anticipated. |

## 3.4 Tick Bites

*Reference CH2M HILL HS-03, Tick Bites*

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

**Prevention** against tick bites includes avoiding tick areas; wearing tightly woven light-colored clothing with long sleeves and wearing pant legs tucked into boots or socks; spraying **only outside** of clothing with insect repellent containing permethrin or permanone, and spraying skin with DEET; and checking yourself frequently for ticks and showering as soon as possible. To prevent chemical repellents from interfering with sample analyses, exercise care while using repellents during the collection and handling of environmental samples.

**If bitten** by a tick, carefully remove the tick with tweezers, grasping the tick as close as possible to the point of attachment while being careful not to crush the tick. After removing the tick, wash your hands and disinfect and press the bite area. The removed tick should be saved. Report the bite to human resources personnel.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF): Lyme - a rash that looks like a bullseye with a small welt in the center; RMSF - a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, bone pain may develop. If symptoms appear, seek medical attention.

## 3.5 Radiological Hazards and Controls

Refer to CH2M HILL's Corporate Health and Safety Program, Program and Training Manual, and Corporate Health and Safety Program, Radiation Protection Program Manual, for standards of practice for operating in contaminated areas. There are no known radiological hazards associated with this project.

## 3.6 Hazards Posed by Chemicals Brought on the Site

### 3.6.1 Hazard Communication

*Reference CH2M HILL Hazard Communication Manual*

CH2M HILL's *Hazard Communication Program Manual,* which is available from area or regional offices and from the Corporate Human Resources Department in Denver, Colorado. The project manager is to request MSDSs from the client or from the contractors and the subcontractors for chemicals to which CCI employees potentially are exposed. The SHSS is to do the following:

- Give employees required site-specific hazard communication (HAZCOM) training.
- Confirm that inventory of chemicals brought on the site by subcontractors is available.
- Before or as chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with identity of chemical and with hazard warnings, if any.

The chemical products listed in Table 3-3 will be used on the site. Refer to Attachment 2 for MSDSs.

**TABLE 3-3**
Chemical Hazards

| Chemical | Quantity | Location |
|---|---|---|
| Methane (calibration gas) | 1 liter, compressed gas | Support Zone |
| Hydrogen (Fuel Gas for FID) | 1 Cylinder | Support Zone |
| Methanol (decontamination) | 4 liters, flammable | Support/Decontamination Zone |
| Hexane (decontamination) | 4 liters, flammable | Support/Decontamination Zone |
| MSA Cleaner/Sanitizer (respirators) | Powder packets | Support/Decontamination Zone |
| Alconox/Liquinox (detergent) | < 1 liter, powder/liquid | Support/Decontamination Zone |

### 3.6.2 Shipping and Transportation of Chemical Products

*Reference CH2M HILL's Procedures for Shipping and Transporting Dangerous Goods*

Nearly all chemicals brought to the site are considered hazardous materials by the Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive the CH2M HILL training in shipping dangerous goods. Hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

## 3.7 Contaminants of Concern

*Reference Project Files for More-Detailed Contaminant Information*

Contaminants of concern are listed in Table 3-4.

**TABLE 3-4**
Contaminants of Concern

| Contaminant | Location and Maximum[a] Concentration (ppm) | Exposure Limit[b] | IDLH[c] | Symptoms and Effects of Exposure | PIP[d] (eV) |
|---|---|---|---|---|---|
| Ethyl Benzene | GW: 3,100 mg/L | 100 ppm | 800 | Eye, skin, and mucous membrane irritation; headache; dermatitis; narcotic; coma | 8.76 |
| Toluene | GW: 15,492 mg/L | 50 ppm | 500 | Eye and nose irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, excessive tearing, nervousness, muscle fatigue, paresthesia, dermatitis, liver and kidney damage | 8.82 |
| Xylenes | GW: 6,700 mg/l | 100 ppm | 900 | Irritated eyes, skin, nose, and throat; dizziness; excitement; drowsiness; incoherence; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis | 8.56 |

Samples were collected in 1998
[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).
[b] Appropriate value of PEL, REL, or TLV listed.
[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.
[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.
ppm = parts per million
$mg/m^3$ = milligram per cubic meter
eV – electron volt

## 3.8 Potential Routes of Exposure

Potential routes of exposure include:

- **Dermal:** Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.
- **Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 5 and 6, respectively.
- **Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before eating, drinking, or smoking).

# 4.0 Personnel

## 4.1 CCI Employee Medical Surveillance and Training

*Reference CH2M HILL SOP HS-01, Medical Surveillance, and HS-02, Health and Safety Training*

The employees listed in Table 4-1 are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SHSS" have received 8 hours of supervisor and instrument training and can serve as SHSS for the level of protection indicated. An SHSS with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and cardiopulmonary resuscitation (CPR). At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities, before being assigned fieldwork.

**TABLE 4-1**
Project Personnel Safety Certifications

| Employee Name | Office | Responsibility | SHSS/FA-CPR |
|---|---|---|---|
| John Custance | ATL | Project Manager | Level C SHSS; FA-CPR |
| Scott Dunbar | ATL | Site Superintendent | Level C SHSS; FA-CPR |
| Terry McElveen | ATL | SHSS | Level C SHSS; FA-CPR |
| Denny Brestle | ATL | QC Manager | Level B SHSS; FA-CPR |
| Robert Nash | ATL | H&S Manager | Level B SHSS; FA-CPR |

## 4.2 Field Team Chain of Command and Communication Procedures

### 4.2.1 Client

**Contact Name:** Eva Clement, Naval Facilities Engineering Command, North Charleston, South Carolina

### 4.2.2 CCI

**Project Manager:** John Custance/ATL

**Health and Safety Manager:** Robert Nash/ATL

**Site Superintendent:** Scott Dunbar/ATL

**Site Health and Safety Specialist:** Terry McElveen

The SHSS is responsible for contacting the site superintendent and the project manager. In general, the project manager either will contact or will identify the client contact. The Health HSM should be contacted as appropriate. The SHSS or the project manager must notify the client and the HSM when a serious injury or a death occurs or when health and safety inspections by the Occupational Safety and Health Administration (OSHA) or other agencies are conducted. Refer to Sections 10 through 12 for emergency procedures and phone numbers.

### 4.2.3 Subcontractors

*Reference Section 3, Corporate Health and Safety Program Manual*

When specified in the project documents (e.g., contract), this plan may cover CCI subcontractors. However, this plan does not address hazards associated with tasks and equipment that the subcontractor has expertise in (e.g., operation of drill rig). Specialty subcontractors are responsible for health and safety procedures and plans specific to their work. Specialty subcontractors are to submit plans to CCI for review and approval before the start of fieldwork. Subcontractors must comply with the established health and safety plan(s). CCI must monitor and enforce compliance with the established plan(s).

General health and safety communication with subcontractors contracted with CCI and covered by this plan is to be conducted as follows:

- Request that the subcontractor, if a specialty subcontractor, submit a safety or health plan applicable to their expertise (e.g., drill-rig safety plan or nuclear density gauge [NDG] health plan); attach the reviewed plan.
- Supply subcontractors with a copy of this plan, and brief them on its provisions.
- Direct health and safety communication to the subcontractor-designated safety representative.
- Notify the subcontractor-designated representative if a violation of the plan(s) is observed. Specialty subcontractors are responsible for mitigating hazards in which they have expertise.
- If a hazard condition persists, inform the subcontractor. If the hazard is not mitigated, stop affected work as a last resort and notify the project manager.
- When an apparent imminent danger exists, promptly remove all affected personnel. Notify the project manager.
- Make clear that consistent violations of the health and safety plan by a subcontractor may result in termination of the subcontract.

# 5.0 Personal Protective Equipment

*Reference CH2M HILL SOP HS-07, Personal Protective Equipment; HS-08, Respiratory Protection*

## 5.1 PPE Specifications

PPE specifications are listed in Table 5-1.

**TABLE 5-1**
PPE Specifications[a]

| Task | Level | Body | Head | Respirator[b] |
|---|---|---|---|---|
| General work uniform when no chemical exposure is anticipated | D | Work clothes; steel-toe, steel-shank leather work boots; work gloves | Hardhat[c]<br>Safety glasses<br>Ear protection[d] | None required |
| Drilling and Sampling | Modified D | **COVERALLS:** Uncoated Tyvek®<br>**BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers<br>**GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant leather or arimid-fiber glove. | Hardhat[c]<br>Splash shield[c]<br>Safety glasses<br>Ear protection[d] | None required |
| Drilling | C | **COVERALLS:** Polycoated Tyvek®<br>**BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers<br>**GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove. | Hardhat[c]<br>Splash shield[c]<br>Ear protection[d]<br>Spectacle inserts | APR, full face, MSA Ultratwin or equivalent; with GME-H[e] cartridges or equivalent |
| **NOT APPROVED FOR THIS ACTIVITY** | B | **COVERALLS:** Polycoated Tyvek®<br>**BOOTS:** Steel toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers<br>**GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove. | Hardhat[c]<br>Splash shield[c]<br>Ear protection[d]<br>Spectacle inserts | Positive-pressure demand self-contained breathing apparatus (SCBA): MSA Ultralite, or equivalent |

[a] Modifications are as indicated. CCI will provide PPE to only CCI employees.
[b] No facial hair that would interfere with respirator fit is permitted.
[c] Hardhat and splash-shield areas are to determined by the SHSS.
[d] Ear protection should be worn while working around drill rigs or other noise-producing equipment or when conversations cannot be held at distances of 3 feet or less without shouting. Refer to Section 6 for other requirements.
[e] The GME-H cartridge is the new standard-issue cartridge. Available stock of the previously standard GMC-H cartridges may be used for tasks covered by this plan.

## 5.2 Upgrading or Downgrading Level of Protection

The reasons for upgrading or downgrading the PPE level are as follows:

- Upgrade
  - Request from individual performing task
  - Change in work task that will increase contact or potential contact with hazardous materials
  - Occurrence or likely occurrence of gas or vapor emission
  - Known or suspected presence of dermal hazards
  - Instrument action levels (Section 6) exceeded
- Downgrade
  - New information indicating that situation is less hazardous than originally thought
  - Change in site conditions that decreases the hazard
  - Change in work task that will reduce contact with hazardous materials

Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been specified in Section 5.0 and an SHSS who meets the requirements specified in Section 4.1 is present.

# 6.0 Air Monitoring Specifications

*Reference CH2M HILL SOP HS-06, Air Monitoring*

Air monitoring specifications are listed in Table 6-1.

**TABLE 6-1**
Air Monitoring Specifications

| Instrument | Action Levels[a] | Frequency[b] | Calibration |
|---|---|---|---|
| **FID** OVA model 128 or equivalent | 0 – 25 ppm – Level D<br>> 25 ppm – Level C<br>> 100 ppm – Stop Work | Initially and periodically during task | Daily |

[a] Action levels apply to sustained breathing-zone measurements above background.
[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SHSS; generally, every 5 to 15 minutes is acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time and measurement result, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3," "at surface/SB-2," etc.).
[c] mg/m3 = milligrams per cubic meter

## 6.1 Calibration Specifications

Calibration specifications are listed in Table 6-2. Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures.

**TABLE 6-2**
Calibration Specifications

| Instrument | Calibration Gas | Span | Reading | Method |
|---|---|---|---|---|
| **FID:** OVA 128 | 100 ppm methane | NA | 100 ppm | 2.5 lpm reg T-tubing |

ppm = parts per million

## 6.2 Air Sampling

Sampling may be required by other OSHA regulations where exposure to certain contaminants may exist. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

### 6.2.1 Method Description

Real time air monitoring will be performed. Contact HSM if assistance is required.

### 6.2.2 Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to: HSM: Robert Nash/ATL.

# 7.0 Decontamination

*Reference CH2M HILL SOP HS-13, Decontamination*

The SHSS must monitor the effectiveness of the decontamination procedures. Decontamination procedures found to be ineffective will be modified by the SHSS.

## 7.1 Decontamination Specifications

Decontamination specifications are listed in Table 7-1.

**TABLE 7-1**
Decontamination Specifications

| Personnel | Sample Equipment | Heavy Equipment |
|---|---|---|
| • Boot wash/rinse<br>• Glove wash/rinse<br>• Body-suit removal<br>• Respirator removal<br>• Hand wash/rinse<br>• Face wash/rinse<br>• Shower ASAP<br>• **PPE-disposal method**<br>Dispose in drums<br>• **Water-disposal method**<br>Dispose in drums | • Wash/rinse equipment<br>• Solvent-rinse equipment<br>• **Solvent-disposal method**<br>Dispose in drums | • Power wash<br>• Steam clean<br>• **Water-disposal method**<br>Dispose in drums |

## 7.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SHSS should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a typical establishment of work zones, including the decontamination line. Work zones are to be modified by the SHSS to accommodate task-specific requirements.

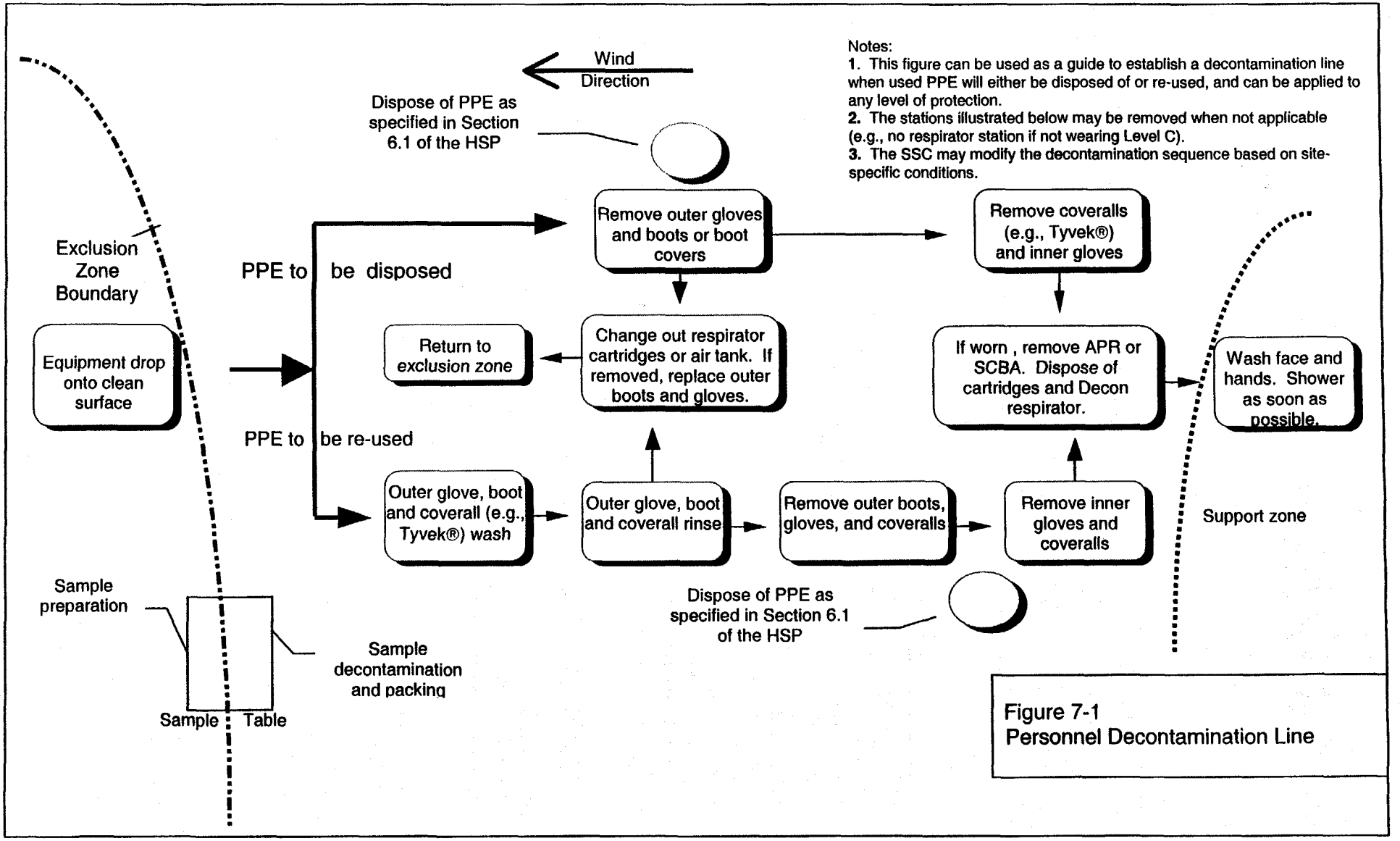


Figure 7-1
Personnel Decontamination Line

# 8.0 Spill Prevention and Control Plan

This Spill Prevention and Control Plan establishes minimum site requirements. Subcontractors are responsible for spill prevention and control related to their operations. Subcontractors written spill prevention and control procedures must be consistent with this plan. Spills must be reported to your supervisor, the site manager, and the Contract Manager.

## 8.1 Spill Prevention

Fuel and chemical storage areas will be properly protected from onsite and offsite vehicle traffic. Fuel storage tanks must be equipped with secondary containment. Fuel tanks must be inspected daily for signs of leaks. Accumulated water must be inspected for signs of product before discharge.

Incidental chemical products must be properly stored, transferred, and used in a safe manner. Should chemical product use occur outside areas equipped with spill control materials, adequate spill control materials must be maintained

## 8.2 Spill Containment and Control

Spill control materials will be maintained in the support zone and at fuel storage and dispensing locations. Incidental spills will be contained with sorbent and disposed of properly. Spilled materials must be immediately contained and controlled. Spill response procedures include:

- Immediately warn any nearby personnel and notify the work supervisor.
- Assess the spill area to ensure that it is safe to approach.
- Activate site evacuation signal if spill presents an emergency.
- Ensure any nearby ignition sources are immediately eliminated.
- If it can be done safely, stop the source of the spill.
- Establish site control for the spill area.
- Use proper personal protective equipment (PPE) in responding to the spill.
- Contain and control spilled material through the use of sorbent booms, pads, or other materials.

## 8.3 Spill Cleanup and Removal

Spilled material, contaminated sorbent, and contaminated media will be cleaned up and removed as soon as possible. Contaminated spill material will be drummed, labeled, and properly stored until material is disposed of. Contaminated material will be disposed of according to applicable federal, state, and local requirements. Contact the regulatory compliance person for the project or the program for assistance.

# 9.0 Confined-Space Entry

*Reference CH2M HILL SOP HS-17, Confined Space Entry*

Confined-space entry requires health and safety procedures, training, and a permit.

When planned activities include confined-space entry, permit-required confined spaces accessible to CCI personnel are to be identified before the task begins. The SHSS will confirm that permit spaces are properly posted or that employees are informed of their locations and informed of their hazards.

When confined space entry is required, the SSHS will maintain a copy of SOP HS-17 onsite.

# 10.0 Site Control Plan

## 10.1 Site Control Procedures

The following site control procedures will be implemented for this CTO:

- SHSS will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of health and safety plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- SHSS records attendance at safety briefings in logbook and documents topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location at sites where project field offices, trailers, or equipment storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Determine wind direction.
- Establish work zones: support, decontamination, and exclusion zones. Delineate work zones with flags or cones as appropriate. The support zone (SZ) should be upwind of the site.
- Establish decontamination procedures, including respirator-decontamination procedures, and test the procedures.
- Use access control at the entry and exit from each work zone.
- Store chemicals in appropriate containers.
- Make MSDSs available for onsite chemicals to which employees are exposed.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Establish procedures for disposing of material generated on the site.
- Initial air monitoring is conducted by the SHSS in appropriate level of protection.

- SHSS is to conduct periodic inspections of work practices to determine the effectiveness of this plan -- refer to CH2M HILL SOP 18, *Health and Safety* Checklist. Deficiencies are to be noted, reported to the HSM, and corrected.

## 10.2 HAZWOPER Compliance Plan

*Reference CH2M HILL SOP HS-17, Health and Safety Plans*

The following procedures are to be followed when certain activities do not require 24- or 40-hour training. Note that prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.

- Certain parts of the site work may be covered by state or federal HAZWOPER standards and therefore require training and medical monitoring. Anticipated tasks must be included in Section 2.2.1.

- Air sampling must confirm that there is no exposure to gases or vapors before non-HAZWOPER-trained personnel are allowed on the site. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to Sections 3.8 and 6.2 for contaminant data and air sampling requirements, respectively.

- Non-HAZWOPER-trained personnel must be informed of the nature of the existing contamination and its locations, the limits of their access, and the emergency action plan for the site. Non-HAZWOPER-trained personnel also must be trained in accordance with other state and federal OSHA requirements, including 29 CFR 1910.1200 (HAZCOM). Refer to Section 3.7.1 for hazard communication requirements.

- Air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-HAZWOPER-trained personnel (e.g., in an adjacent area) are not exposed to volatile contaminants. Non-HAZWOPER-trained personnel should be monitored whenever the belief is that there may be a possibility of exposure (e.g., change in site conditions), or at some reasonable frequency to confirm that there is no exposure. Refer to Section 6.1 for air monitoring requirements.

- Treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the HAZWOPER standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only HAZWOPER-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-HAZWOPER-trained personnel must leave the site.

If HAZWOPER-regulated tasks are conducted concurrently with nonregulated tasks, non-HAZWOPER-trained subcontractors must be removed from areas of exposure. If non-HAZWOPER-trained personnel remain on the site while a HAZWOPER-regulated task is conducted, the contaminant/exposure area (exclusion zone) must be posted, non-HAZWOPER-trained personnel must be reminded of the locations of restricted areas and the limits of their access, and real-time monitoring must be conducted. Non-HAZWOPER-trained personnel at risk of exposure must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

# 11.0 Emergency Response Plan

*Reference CH2M HILL SOP HS-12, Emergency Response*

## 11.1 Pre-Emergency Planning

SHSS performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Locate the nearest telephone; determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Identify and communicate chemical, safety, radiological, and biological hazards.
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Post site map marked with locations of emergency equipment and supplies, and post OSHA job-site poster. The OSHA job-site poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Evaluate capabilities of local response teams where applicable.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, chemical and vapor releases.
- Review notification procedures for contacting CCI's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once before site activities begin, including driving the route to the hospital.

- Brief new workers on the emergency response plan.
- The SHSS will evaluate emergency response actions and initiate appropriate follow-up actions.

## 11.2 Emergency Equipment and Supplies

The SHSS should mark the locations of emergency equipment on the site map and should post the map. Emergency equipment and its location are listed in Table 11-1.

**TABLE 11-1**
Emergency Equipment

| Emergency Equipment and Supplies | Location |
|---|---|
| 20 lb (or two 10-lb) fire extinguisher (A, B, and C classes) | In Field Vehicle |
| First aid kit | In Field Vehicle |
| Eye wash | In Field Vehicle |
| Potable water | In Field Vehicle |
| Bloodborne-pathogen kit | In Field Vehicle |
| Additional equipment (specify) | |

## 11.3 Emergency Medical Treatment

Emergency medical treatment procedures are as follows:

- Notify appropriate emergency response authorities listed in Sections 11.9 and 11.11 (e.g., 911).
- During a time of no emergency, contact CCI's medical consultant for advice and guidance on medical treatment.
- The SHSS will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Notify the field team leader and the project manager of the injury.
- Make certain that the injured person is accompanied to the emergency room.
- Notify the health and safety manager.
- Notify the injured person's human resources department within 24 hours.

- Prepare an incident report -- refer to CH2M HILL SOP 12, *Emergency Response and First Aid*. Submit the report to the corporate director of health and safety and the corporate human resources department within 48 hours.
- When contacting the medical consultant, state that you are calling about a CCI matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.

## 11.4 Non-emergency Procedures

The procedures listed above may be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CCI medical consultant.

When contacting the medical consultant, state that the situation is a CCI matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken. Follow these procedures as appropriate.

## 11.5 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CCI operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Notify appropriate response personnel.
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

## 11.6 Evacuation

Evacuation procedures are as follows:

- Evacuation routes will be designated by the SHSS before work begins.
- Onsite and offsite assembly points will be designated before work begins.
- Personnel will leave the exclusion zone and assemble at the onsite assembly point upon hearing the emergency signal for evacuation.
- Personnel will assemble at the offsite point upon hearing the emergency signal for a site evacuation.
- SHSS and a "buddy" will remain on the site after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- SHSS accounts for all personnel in the onsite assembly zone.

- A person designated by the SHSS before work begins will account for personnel at the offsite assembly area.
- The SHSS will write up the incident as soon as possible after it occurs and will submit a report to the corporate director of health and safety.

## 11.7 Evacuation Routes and Assembly Points

Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map posted at the site.

## 11.8 Evacuation Signals

Evacuation signals are listed in Table 11-2.

**TABLE 11-2**
Evacuation Signals

| Signal | Meaning |
|---|---|
| Grasping throat with hand | Emergency–help me |
| Thumbs up | OK; understood |
| Grasping buddy's wrist | Leave area now |
| Continuous sounding of horn | Emergency; leave site now |

## 11.9 Emergency Response Telephone Numbers

Emergency response telephone numbers are listed in Table 11-3.

**TABLE 11-3**
Emergency Response Telephone Numbers

| Site Address: | Phone:<br>Cellular Phone: |
|---|---|
| **Police:** Whiting Field Police | **Phone:** 850/623-7431 |
| **Fire:** Whiting Field Fire Department | **Phone:** 850/623-7331 |
| **Ambulance:** Base Fire Department | **Phone:** 850/623-7444 |
| **Hospital:** Santa Rosa Medical Center<br>**Address:** 1450 Berryhill Rd. Milton, FL 32570 | **Phone: 850/623-9741** |

*When using a cellular phone outside the telephone's normal calling area, exercise caution in relying on the cellular phone to activate 911. When the caller is outside the normal calling area, the cellular service carrier should connect the caller with emergency services in the area where the call originated, but this may not occur. Telephone numbers of backup emergency services should be provided if a cellular phone is relied on to activate 911.

- **Route to Hospital:** From BASE Main Gate, turn LEFT (SOUTH) and proceed 9 miles south west to Milton and turn RIGHT on Berryhill Rd.

The hospital location map is provided in Figure 11-1.

## 11.10 Government Agencies Involved in Project

**Federal Agency and Contact Name:** Naval Facilities Engineering Command

Contact the project manager. Generally, the project manager will contact relevant government agencies.

## 11.11 Emergency Contacts

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification MUST be made within 24 hours of the injury. Emergency contacts are listed in Table 11-4.

**TABLE 11-4**
Emergency Contacts

| | |
|---|---|
| **CCI Medical Consultant**<br>Dr. Peter P Greany<br>WorkCare Inc.,333 S. Anita Drive<br>Orange, CA 92868, 800/455-6155<br>(After-hours calls will be returned within 20 minutes.) | **Occupational Physician ( Local)** |
| **CCI Drug-Free Workplace Program Administrator**<br>Alicia Sweeney/ATL<br>770/604-9095 | **Site Safety and Health Specialist (SHSS)**<br>Terry McElveen<br>770/604-9095 |
| **Navy RAC Health and Safety Manager (HSM)**<br>Robert Nash/ATL<br>770/604-9095 | **Project Manager**<br>John Custance<br>770/604-9095 |
| **Radiation Health Manager (RHM)**<br>Dave McCormack/SEA<br>206/453-5000 | **Human Resources Manager**<br>Nancy Orr /DEN<br>303/771-0925 |
| **Client**<br>Eva Clements<br>Naval Facilities Engineering Command | **Corporate Human Resources Department**<br>Julie Zimmerman/COR<br>303/771-0900 |
| **Federal Express Dangerous Goods Shipping**<br>800/238-5355<br>CH2M HILL Emergency Number for Shipping Dangerous Goods<br>800/255-3924 | **Worker's Compensation and Auto Claims**<br>Sterling Administrative Services<br>800/420-8926 After hours 800/497-4566<br>Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars. |

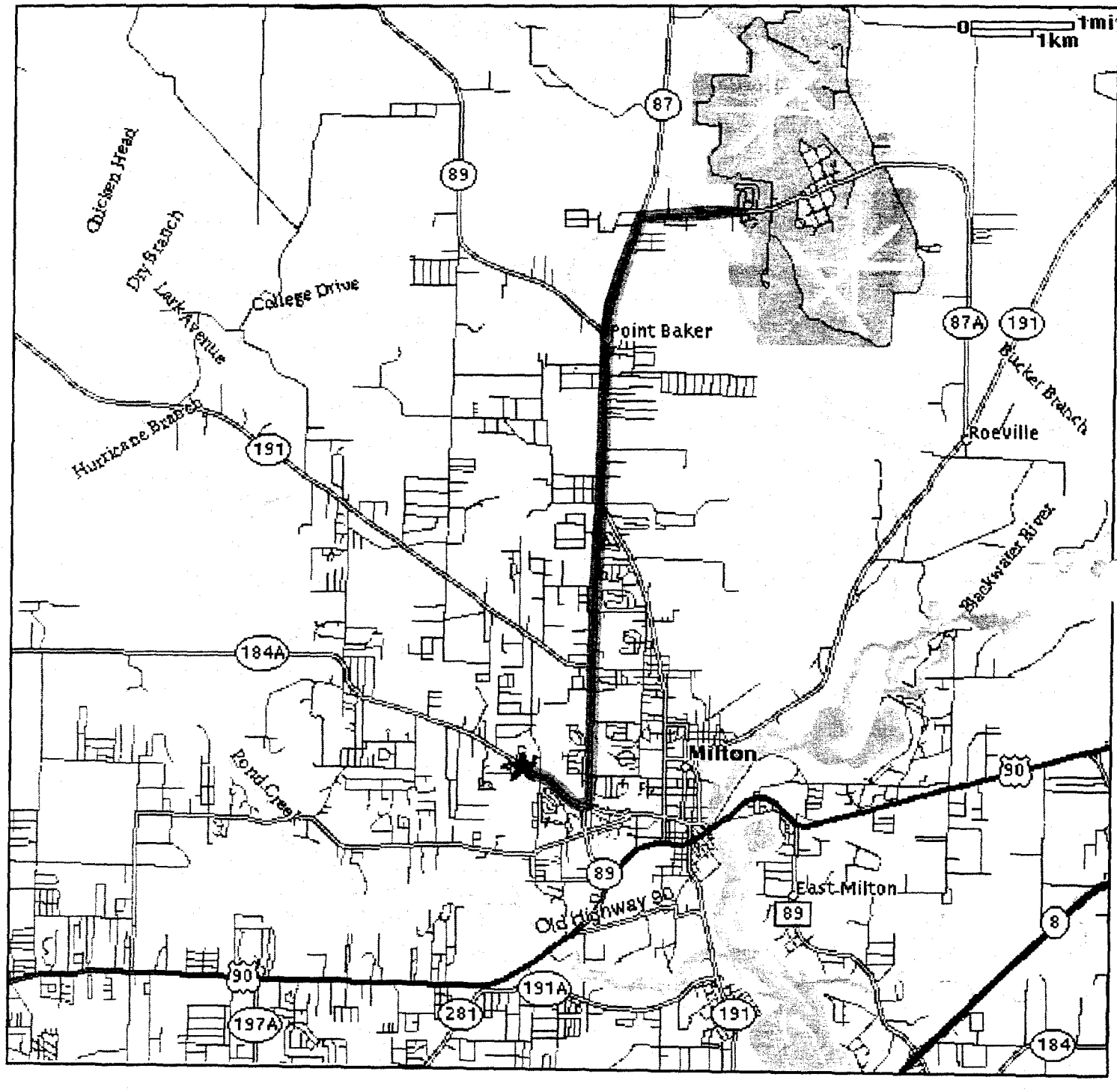




**Figure 11-1**
Hospital Location Map

# 12.0 Approval

This site-specific health and safety plan has been written for use by CCI only. CCI claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

## 12.1 Original Plan

Written by: Date:

Approved by: Robert Nash Date: August 2000

## 12.2 Revisions

Revisions Made by: Date:

Revisions to Plan:

Revisions Approved by: Date:

# 13.0 Distribution

Distribution for this plan is listed in Table 13-1.

**TABLE 13-1**
Distribution List

| Name | Office | Responsibility | Number of Copies |
|---|---|---|---|
| Robert Nash | ATL | Health and Safety Manager/Approver | 1 |
| John Custance | ATL | Project Manager | 1 |
| Scott Dunbar | ATL | Site Superintendent/Field Team | |
| Terry McElveen | ATL | Site Safety and Health Specialist | 1 |
| Client | NA | Client Project Manager | |

# Attachment 1

## Employee Signoff

## EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CCI project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

**Project Name**: Whiting Field **Project Number:**

| **EMPLOYEE NAME** (Please print) | **EMPLOYEE SIGNATURE** | **COMPANY** | **DATE** |
|---|---|---|---|
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# Attachment 2

## Project Specific Chemical Product Hazard Communication Form

# Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SSC will verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

**Project Name:** Whiting Field **Project Number:**

**MSDSs will be maintained at the following location(s):**

*Hazardous Chemical Products Inventory*

| Chemical | Quantity | Location | MSDS Available | *Container labels* Identity | Hazard |
|---|---|---|---|---|---|
| Methane | 1 liter, compressed | Support Zone | | | |
| Hydrogen | 1 Cylinder | Support/Decon Zones | | | |
| Methanol | < 1 Gallon | Support/Decon Zones | | | |
| Hexane | < 1 Gallon | Support/Decon Zones | | | |
| MSA Sanitizer | < 1 liter | Support/Decon Zones | | | |
| Alconox/Liquinox | < 1liter | Support/Decon Zones | | | |
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Refer to SOP HS-05 *Hazard Communication* for more detailed information.

# Attachment 3

## Chemical-Specific Training Form

# CCI CHEMICAL-SPECIFIC TRAINING FORM

| | |
|---|---|
| Location: Whiting Fleld | Project # : |
| SSHS: | Trainer: |

**TRAINING PARTICIPANTS:**

| NAME | SIGNATURE | NAME | SIGNATURE |
|---|---|---|---|
| | | | |
| | | | |
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**REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:**

| | |
|---|---|
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| | |

The HCC will use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants will have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program will be made available for employee review in the facility/project hazard communication file.

# Attachment 4

## Material Safety Data Sheets

# Alconox ®

## MATERIAL SAFETY DATA SHEET

**Alconox, Inc.**
9 East 40th Street, Suite 200
New York, NY 10016

### I. IDENTIFICATION

| | |
|---|---|
| Product Name (as appears on label) | ALCONOX |
| CAS Registry Number: | Not Applicable |
| Effective Date: | January 1, 1998 |
| Chemical Family: | Anionic Powdered Detergent |

### II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in ALCONOX as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

### III. PHYSICAL/CHEMICAL CHARACTERISTICS

| | |
|---|---|
| Boiling Point (F): | Not Applicable |
| Vapor Pressure (mm Hg): | Not Applicable |
| Vapor Density (AIR=1): | Not Applicable |
| Specific Gravity (Water=1): | Not Applicable |
| Melting Point: | Not Applicable |
| Evaporation Rate (Butyl Acetate=1): | Not Applicable |
| Solubility in Water: | Appreciable-Soluble to 10% at ambient conditions |
| Appearance: | White powder interspersed with cream colored flakes. |

### IV. FIRE AND EXPLOSION DATA

| | |
|---|---|
| Flash Point (Method Used): | None |
| Flammable Limits: | LEL: No Data<br>UEL: No Data |
| Extinguishing Media: | Water, dry chemical, $CO_2$, foam |
| Special Firefighting Procedures: | Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals. |
| Unusual Fire and Explosion Hazards: | None |

### V. REACTIVITY DATA

| | |
|---|---|
| Stability: | Stable |
| Hazardous Polymerization: | Will not occur |
| Incompatibility (Materials to Avoid): | None |
| Hazardous Decomposition or Byproducts: | May release $CO_2$ on burning |

## VI. HEALTH HAZARD DATA

| | |
|---|---|
| Route(s) of Entry: | Inhalation? Yes<br>Skin? No<br>Ingestion? Yes |
| Health Hazards (Acute and Chronic): | Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating. |
| Carcinogenicity: | NTP? No<br>IARC Monographs? No<br>OSHA Regulated? No |
| Signs and Symptoms of Exposure: | Exposure may irritate mucous membranes. May cause sneezing. |
| Medical Conditions Generally Aggravated by Exposure: | Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder. |
| Emergency and First Aid Procedures: | Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician.<br>Skin: Flush with plenty of water.<br>Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs readminister fluids. See a physician for discomfort. |

## VII. PRECAUTIONS FOR SAFE HANDLING AND USE

| | |
|---|---|
| Steps to be Taken if Material is Released or Spilled: | Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable. |
| Waste Disposal Method: | Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products. |
| Precautions to be Taken in Storing and Handling: | Material should be stored in a dry area to prevent caking. |
| Other Precautions: | No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical. |

## VIII. CONTROL MEASURES

| | |
|---|---|
| Respiratory Protection (Specify Type): | Dust mask - Recommended |
| Ventilation: | Local Exhaust-Normal<br>Special-Not Required<br>Mechanical-Not Required<br>Other-Not Required |
| Protective Gloves: | Impervious gloves are useful but not required. |
| Eye Protection: | Goggles are recommended when handling solutions. |
| Other Protective Clothing or Equipment: | None |
| Work/Hygienic Practices: | No special practices required |

BACHARACH -- CALIBRATION GAS, METHANE 500 PPM IN AIR, 51-1816
MATERIAL SAFETY DATA SHEET
NSN: 663000N048469
Manufacturer's CAGE: 05083
Part No. Indicator: A
Part Number/Trade Name: CALIBRATION GAS, METHANE 500 PPM IN AIR, 51-1816

## General Information

Company's Name: BACHARACH INC
Company's Street: 625 ALPHA DR
Company's City: PITTSBURGH
Company's State: PA
Company's Country: US
Company's Zip Code: 15238
Company's Emerg Ph #: 800-424-9300(CHEMTREC)
Company's Info Ph #: 412-963-2223
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 13DEC90
Safety Data Review Date: 17FEB94
MSDS Serial Number: BTYRS
Hazard Characteristic Code: NK

## Ingredients/Identity Information

Proprietary: NO
Ingredient: METHANE. BP:-260F,-162C. MP:-296F,-182C. FL PT:-306F,-188C.
Ingredient Sequence Number: 01
Percent: 0.05
NIOSH (RTECS) Number: PA1490000
CAS Number: 74-82-8
OSHA PEL: N/K (FP N)
ACGIH TLV: ASPHYXIANT

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Proprietary: NO
Ingredient: AIR, REFRIGERATED LIQUID; (AIR)
Ingredient Sequence Number: 02
Percent: 99.95
NIOSH (RTECS) Number: AX5271000
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

## Physical/Chemical Characteristics

Appearance And Odor: COLORLESS, ODORLESS, TASTELESS COMPRESSED GAS IN CYLINDERS.
Boiling Point: SEE ING 1
Melting Point: SEE ING 1
Vapor Pressure (MM Hg/70 F): (GAS)
Vapor Density (Air=1): 0.991
Specific Gravity: 0.673
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: 100
pH: N/A

## Fire and Explosion Hazard Data

Flash Point: SEE ING 1
Flash Point Method: CC
Lower Explosive Limit: 5%
Upper Explosive Limit: 15%
Extinguishing Media: MEDIA SUITABLE FOR SURROUNDING FIRE (FP N). THIS GAS IS NOT FLAMMABLE. COOL EXPOSED CONTAINERS W/WATER.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N). USE SHIELDING TO PROTECT FROM CYLINDER EXPLOSION.
Unusual Fire And Expl Hazrds: THIS MIXT IS BELOW LEL OF METHANE & NON-FLAMM. COMPRESSED AIR/METHANE MIXTS AT HIGH PRESS WILL ACCELERATE BURNING OF OTHER MATLS. GAS CYLS EXPOS TO HEAT(SUPDAT)

## Reactivity Data

Stability: YES
Cond To Avoid (Stability): AVOID HEAT OR FLAMES.
Materials To Avoid: NONE KNOWN.
Hazardous Decomp Products: NONE KNOWN.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

## Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: NO
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE:EYE/SKIN:NONE KNOWN OR EXPECTED. INHAL:NONE. METHANE IS NON-TOXIC SIMPLE ASPHYXIANT. CONCENTRATION OF METHANE IN THIS GAS IS TOO LOW TO DEPRESS OXYGEN CONCENTRATION. INGEST:NOT APPLICABLE. THIS MATERIAL IS A GAS. METHANE IS BIOLOGICALLY INACTIVE & ESSENTIALLY NON TOXIC. CHRONIC:NONE KNOWN OR EXPECTED.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: NONE SPECIFIED BY MANUFACTURER.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INGEST:CALL MD IMMEDIATELY (FP N). INHAL: REMOVE IMMEDIATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINUTES, SEEK ASSISTANCE FROM MD (FP N). SKIN:FLUSH W/COPIOUS AMOUNTS OF WATER. CALL MD (FP N). NONE NEEDED (MFR).

## Precautions for Safe Handling and Use

Steps If Matl Released/Spill: NONE NEEDED. THIS MATERIAL IS NON TOXIC & NON-FLAMMABLE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSE I/A/W ALL LOCAL, STATE & FEDERAL REGULATIONS. DO NOT INCINERATE CYLINDER.
Precautions-Handling/Storing: DO NOT STORE CYLS NEAR HEAT/OPEN FLAME. EXPOS TO TEMPS 130F MAY CAUSE RUPTURE. SECURE CYLS - DO NOT DROP. CONTENTS UNDER PRESS.
Other Precautions: DO NOT PUNCTURE. NEVER THROW CNTNR INTO FIRE/INCIN. KEEP CYLS SECURED. DO NOT DROP/DMG. USE PRESS REGULATOR WHEN CONNECTING TO

LOWER PRESS PIPING SYS. USE CHECK VALVE TO PVNT BACKFLOW. KEEP CYLS AWAY FROM HEAT & FLAMES. FOR ADDNL (SUPDAT)

## Control Measures

Respiratory Protection: NONE NEEDED. SELECTION OF NIOSH/MSHA APPROVED RESPIRATORY PROTECTION DEPENDS ON CONTAMINANT TYPE, FORM & CONCENTRATION. SELECT I/A/W OSHA 1910.134 & GOOD INDUSTRIAL HYGIENE PRACTICE.
Ventilation: NO SPECIAL VENTILATION REQUIRED.
Protective Gloves: LEATHER GLOVES.
Eye Protection: SAFETY GLASSES.
Other Protective Equipment: NONE NEEDED.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: EXPLO HAZ:OR FLAME MAY VENT RAPIDLY/EXPLODE. OTHER PREC:HNDLG RECS ON COMPRESSED GAS CYLS, CONSULT COMPRESSED GAS ASSOC PAMPHLET P-1. PROTECT FROM HEAT & PHYSICAL DMG.

## Transportation Data

## Disposal Data

## Label Data

Label Required: YES
Technical Review Date: 17FEB94
Label Date: 16FEB94
Label Status: G
Common Name: CALIBRATION GAS, METHANE 500 PPM IN AIR, 51-1816
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-None: X
Contact Hazard-None: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: NON-FLAMMABLE, BUT COMPRESSED AIR/METHANE WILL ACCELERATE BURNING OF OTHER MATERIALS. CYLINDERS EXPOSED TO HIGH HEAT MAY EXPLODE. ACUTE:EYE/SKIN:NONE KNOWN OR EXPECTED. INHAL:NONE. METHANE IS NON-TOXIC SIMPLE ASPHYXIANT. CONCENTRATION OF METHANE IN THIS GAS IS TOO LOW TO DEPRESS OXYGEN CONCENTRATION. INGEST:NOT APPLICABLE. THIS MATERIAL IS A GAS. CHRONIC:NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: BACHARACH INC
Label Street: 625 ALPHA DR
Label City: PITTSBURGH
Label State: PA
Label Zip Code: 15238
Label Country: US
Label Emergency Number: 800-424-9300(CHEMTREC)

AIR PRODUCTS & CHEMICALS -- HYDROGEN, COMPRESSED - HYDROGEN,HIGH PURITY
MATERIAL SAFETY DATA SHEET
NSN: 6830010114102
Manufacturer's CAGE: 00742
Part No. Indicator: A
Part Number/Trade Name: HYDROGEN, COMPRESSED

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General Information

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Item Name: HYDROGEN,HIGH PURITY
Company's Name: AIR PRODUCTS AND CHEMICALS, INC.
Company's Street: 7201 HAMILTON BLVD
Company's P. O. Box: 538
Company's City: ALLENTOWN
Company's State: PA
Company's Country: US
Company's Zip Code: 18195-1501
Company's Emerg Ph #: 800-523-9374/610-481-7711
Company's Info Ph #: 215-481-4911/800-752-1597
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SE
Date MSDS Prepared: 01JUN94
Safety Data Review Date: 30OCT95
Supply Item Manager: GSA
MSDS Preparer's Name: NK
Preparer's Company: (MSDS #:1009)
Preparer's St Or P. O. Box: 538
Preparer's City: ALLENTOWN
Preparer's State: PA
Preparer's Zip Code: 18195
MSDS Serial Number: BHFBW
Specification Number: UNKNOWN
Spec Type, Grade, Class: NK
Hazard Characteristic Code: G2
Unit Of Issue: CF
Unit Of Issue Container Qty: UNKNOWN
Type Of Container: CYLINDER
Net Unit Weight: UNKNOWN
Net Explosive Weight: NK
Coast Guard Ammunition Code: NK

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: HYDROGEN
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: MW8900000
CAS Number: 1333-74-0
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

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Physical/Chemical Characteristics

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Appearance And Odor: FLAMM, OLORLESS, ODORLESS, COMPRESSED GAS PKG IN CYL @HIGH PRESSURE.
Boiling Point: -423F,-253C
Melting Point: -435F,-259C
Vapor Pressure (MM Hg/70 F): N/A
Specific Gravity: 0.0696@32F/1ATM
Solubility In Water: 0.019 VOL/VOL @60F.
Viscosity: N/A
pH: N/A
Radioactivity: NK
Autoignition Temperature: 565.5C
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## Fire and Explosion Hazard Data

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Flash Point: FLAMMABLE GAS
Lower Explosive Limit: 4
Upper Explosive Limit: 74
Extinguishing Media: CO2, DRY CHEMICAL, WATER SPRAY OR FOG FOR SURROUNDING AREA. DO NOT EXTINGUISH UNTIL HYDROGEN SOURCE IS SHUT OFF.
Special Fire Fighting Proc: EVACUATE PERSONNEL FRM DANGER AREA.IMMED COOL CNTNR W/WATERSPRAY FRM MAX DISTANCE TAKING CARE NOT TO EXT FLAMES.IF ACCIDENTALLY EXT EXPLO RE-IGN MAY OCCUR.(SUP)
Unusual Fire And Expl Hazrds: BURNS W/PALE BLUE,NEARLY INVISIBLE FLAM. EASILY IGN W/LOW-IGN ENERGY(STATIC ELECT).LIGHTER THAN AIR;ACCUMULATE IN UPPER SEC OF ENCLSD SPACES.PRESSURE IN (SUPPLE)
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## Reactivity Data

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Stability: YES
Cond To Avoid (Stability): PER MSDS:NONE. HOWEVER REMOVE ALL IGN SOURCES. HANDLE CYLINDERS CAREFULLY.
Materials To Avoid: OXIDIZING AGENTS. SOME STEELS ARE SUSCEPTIBLE TO HYDROGEN EMBRITTLEMENT @HIGH PRESSURES & TEMPS.
NONE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE
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## Health Hazard Data

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LD50-LC50 Mixture: HYDROGEN IS A SIMPLE ASPHYXIANT.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: INHAL:ASPHYXIANT.BEFORE SUFFOCATION COULD OCCUR LOWER FLAMM LIMIT OF PROD IN AIR WOULD BE EXCEEDED POSSIBLY CAUSING BOTH OXY-DEFICIENT & EXPLO ATM.EXPO TO MODERATE CONCEN MAY CAUSE DIZZ,HEAD, NAU,UNCONSC.EXPO TO ATM W/8-10% OR LESS OXY WILL QUICKLY BRING ABOUT UNCONSC W/O WARNING.LACK OF SUFFICIENT OXY MAY CAUSE (SUPPL)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: PER MSDS:HYDROGEN IS NOT LISTED BY NTP/OSHA/ IARC.
Signs/Symptoms Of Overexp: EXPOSURE TO AN OXYGEN-DEFICIENT ATM (<19.5%) MAY CAUSE DIZZINESS, DROWSINESS, NAUSEA, VOMITING, EXCESS SALIVATION, DIMINISHED MENTAL ALERTNESS, LOSS OF CONSCIOUSNESS, AND DEATH.

Med Cond Aggravated By Exp: NONE. TARGET ORGANS:NONE.
Emergency/First Aid Proc: INHAL:PERSONS SUFFERING FROM LACK OF OXYGEN SHOULD BE REMOVED TO FRESH AIR. IF VICTIM IS NOT BREATHING, ADMINISTER ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. OBTAIN PROMPT MEDICAL ATTN. SKIN/EYE/INGEST:NONE. NOTES TO PHYSICIAN:NONE.

## Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE IMMED.REMOVE POSSIBLE IGN SOURCES. PROVIDE MAX EXPLO-PROOF VENTI.SHUT OFF SOURCE IF POSSIBLE.IF LEAK FRM CYL/ VALVE CALL AIR PRODUCTS.PRESENCE OF H2 FLAME CAN BE DETECTED BY APPROACHING CAUT W/OUTSTRETCHED STRAW BROOM MAKING FLAME VISIBLE.
Neutralizing Agent: NOT APPLICABLE
Waste Disposal Method: DON'T ATTEMPT TO DISPOSE OF RESIDUAL/UNUSED PROD IN CYL.RETURN TO SUPPLIER FOR SAFE DISPOSAL.RESIDUAL PROD W/IN PROCESS SYS MAY BE VENTED @CONTROLLED RATE TO ATM THRU VENT STACK THAT DISCHARGES TO ELEVATED PT.STACK IN ISOLATED AREA AWAY FRM IGN SOURC
Precautions-Handling/Storing: NFPA 50A REQMT.STORE CYL UPRIGHT W/VAL PROT CAP IN PLACE @WELL-PROT WELL-VENTI DRY LOCATION SEPARATED FRM COMBUST MATLS.CYL TEMP SHOULDN'T REACH >125F
Other Precautions: SEPARATE CYL FRM OXY CYL/OXIDIZERS BY 20FT(MIN)DISTANCE OR BARRIER OF NONCOMBUST MATL @LEAST 5FT HI W/@LEAST 1/2 HR FIRE RESISTANCE RATING.PROT FRM PHYS DMG.DON'T DRAG/ROLL/DROP-USE HANDTRUCK.EXPLO PROOF IN STORAGE/USE AREAS (SUPPLEMENT)

## Control Measures

Respiratory Protection: GENERAL USE:NONE. EMERG USE:AIR SUPPLIED RESPIRATORS ARE REQUIRED IN OXY-DEFICIENT ATMS.BEFORE ENTERING AREA YOU MUST CHECK FOR FLAMM OR OXY-DEFICIENT ATMS.
Ventilation: PROVIDE NATURAL OR EXPLO-PROOF VENTI ADEQUATE TO ENSURE HYDROGEN DOESN'T REACH ITS LOWER EXPLO LIMIT OF 4%.
Protective Gloves: WORK GLOVES WHEN HANDLING CYLINDER.
Eye Protection: SAFETY GLASSES WHEN HANDLING CYLINDER.
Other Protective Equipment: SAFETY SHOES ARE RECOMMENDED WHEN HANDLING CYLINDERS.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: FIREFTG:STOP FLOW OF GAS W/O RISK WHILE CONT COOLING WATERSPRAY. EXPLO/FIRE HAZ:CNTNR CAN BUILDUP DUE TO HEAT;MAY RUPTURE IF PRESSURE RELIEF DEVICES FAIL TO WORK. HEALTH HAZ:SERIOUS INJURY/ DEATH.EYE/SKIN/CHRONIC:NONE. OTHER PREC:(NAT ELECT CODE CLASS I HAZ).USE LEAK DETECTION SOLN.DO NOT USE ADAPTERS.

## Transportation Data

Trans Data Review Date: 95303
DOT PSN Code: HLR
DOT Proper Shipping Name: HYDROGEN, COMPRESSED
DOT Class: 2.1
DOT ID Number: UN1049
DOT Label: FLAMMABLE GAS
DOT/DoD Exemption Number: NK
IMO PSN Code: IGH
IMO Proper Shipping Name: HYDROGEN, COMPRESSED
IMO Regulations Page Number: 2148
IMO UN Number: 1049
IMO UN Class: 2(2.1)

IMO Subsidiary Risk Label: -
IATA PSN Code: NSD
IATA UN ID Number: 1049
IATA Proper Shipping Name: HYDROGEN, COMPRESSED
IATA UN Class: 2.1
IATA Label: FLAMMABLE GAS
AFI PSN Code: NSD
AFI Symbols: 0
AFI Prop. Shipping Name: HYDROGEN, COMPRESSED
AFI Class: 2.1
AFI ID Number: UN1049
AFI Basic Pac Ref: A6.3,A6.7
MMAC Code: NK
N.O.S. Shipping Name: HYDROGEN, COMPRESSED.
Additional Trans Data: PER MSDS:DOT SHIPPING NAME:HYDROGEN, COMPRESSED, HAZ 2.1, UN 1049, RQ:NONE, LABEL:FLAMM GAS. CYLINDER SHOULD BE TRANSP IN SECURE UPRIGHT POSITION IN WELL VENTI TRUCK. NEVER TRANSP IN PASSENGER COMPARTMENT OF VEHICLE.

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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 30OCT94
Label Status: F
Common Name: HYDROGEN, COMPRESSED
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-None: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: FLAMM COMPRESSED GAS.INHAL:ASPHYXIANT.BEFORE SUFFOCATION COULD OCCUR LOWER FLAMM LIMIT OF PROD IN AIR WOULD BE EXCEEDED POSSIBLY CAUSING BOTH OXY-DEFICIENT & EXPLO ATM.EXPO TO MODERATE CONCEN MAY CAUSE DIZZ,HEAD,NAU,UNCONSC.EXPO TO ATM W/8-10% OR LESS OXY WILL QUICKLY BRING ABOUT UNCONSC W/O WARNING.LACK OF SUFFICIENT OXY MAY CAUSE SERIOUS INJURY OR DEATH.TARGET ORGANS:NONE.1STAID:INHAL:SUFFERING FRM LACK OF OXY SHOULD BE REMOVED TO FRESH AIR.NOT BREATH ADMINISTER ART RESP.BREATH DIFFICULT ADMINISTER OXY.GET PROMPT MED ATTN.SKIN/EYE/INGEST:NONE.FIRE:CO2, DRY CHEM,WATERSPRAY/FOG.DON'T EXTINGUISH TIL HYDROGEN SOURCE IS SHUT OFF.
Label Name: AIR PRODUCTS AND CHEMICALS, INC.
Label Street: 7201 HAMILTON BLVD
Label City: ALLENTOWN
Label State: PA
Label Zip Code: 18195-1501
Label Country: US
Label Emergency Number: 800-523-9374/610-481-7711

ALDRICH CHEMICAL SUB OF SIGMA-ALDRICH -- 65550 METHANOL
MATERIAL SAFETY DATA SHEET
NSN: 681000F030311
Manufacturer's CAGE: 60928
Part No. Indicator: A
Part Number/Trade Name: 65550 METHANOL

## General Information

Company's Name: ALDRICH CHEMICAL CO SUB OF SIGMA-ALDRICH
Company's Street: 1001 W ST PAUL AVE
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53233
Company's Emerg Ph #: 800-325-5832-S/800-231-8327-A
Company's Info Ph #: 800-325-5832-S/800-231-8327-A
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 01APR92
Safety Data Review Date: 30SEP93
Preparer's Company: ALDRICH CHEMICAL CO SUB OF SIGMA-ALDRICH
Preparer's St Or P. O. Box: 1001 W ST PAUL AVE
Preparer's City: MILWAUKEE
Preparer's State: WI
Preparer's Zip Code: 53233
MSDS Serial Number: BRXZV

## Ingredients/Identity Information

Proprietary: NO
Ingredient: METHANOL (METHYL ALCOHOL), COLUMBIAN SPIRITS
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: PC1400000
CAS Number: 67-56-1
OSHA PEL: S,200PPM/250STEL
ACGIH TLV: S,200PPM/250STEL; 93
Other Recommended Limit: 200 PPM

## Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID
Boiling Point: 64.6C
Melting Point: -98C
Vapor Pressure (MM Hg/70 F): 97.68
Vapor Density (Air=1): 1.1
Specific Gravity: 0.791

## Fire and Explosion Hazard Data

Flash Point: 52F
Lower Explosive Limit: 6%
Upper Explosive Limit: 36%
Extinguishing Media: CO2, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: WEAR SELF-CONTAINED BREATHING APPARATUS & FULL

PROTECTIVE CLOTHING.
Unusual Fire And Expl Hazrds: VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO 725F.

## Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, OPEN FLAME OR OTHER SOURCES OF IGNITION.
Materials To Avoid: ACIDS, ACID CHLORIDES, ACID ANHYDRIDES, OXIDIZING/ REDUCING AGENTS, ALKALI METALS.
Hazardous Decomp Products: CO, CO2
Hazardous Poly Occur: NO

## Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT): 5628 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR OR MIST IS IRRITATING TO THEY EYES, MUCOUS MEMBRANES, SKIN, & UPPER RESPIRATORY TRACT. CAN CAUSE DAMAGE TO THE EYES, LIVER, HEART, KIDNEYS. GASTROINTESTINAL DISTURBANCES & CONVULSIONS. MAY CAUSE BLINDNESS IF INGESTED.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: OPTIC NERVE NEUROPATHY, VISUAL FIELD CHANGES, HEADACHE, DYSPNEA, NAUSEA, VOMITING.
Med Cond Aggravated By Exp: CUTS, SCRATCHES
Emergency/First Aid Proc: EYES/SKIN: FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MINS WHILE REMOVING CONTAMINATED CLOTHING & SHOES. INHALATION: REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHIG IS DIFFICULT, GIVE OXYGEN. INGESTION: WASH OUT MOUTH W/WATER PROVIDED PERSON IS CONSCIOUS. DISCARD CONTAMINATED CLOTHING & SHOES. OBTAIN MEDICAL ATTENTION IN ALL CASES.

## Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. SHUT OFF ALL IGNITION SOURCES. USE PROTECTIVE EQUIP. COVER W/DRY-LIME, SAND OR SODA ASH. PLACE IN COVERED CONTAIERS USING NON-SPARKING TOOLS & TRANSPORT OUTDOORS. VENTILATE AREA & WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
Neutralizing Agent: DRY LIME, SAND OR SODA ASH
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS THIS MATERIAL IS HIGHLY FLAMMABLE. OBSERVE ALL FEDERAL, STATE & LOCAL LAWS. UN1230.
Precautions-Handling/Storing: KEEP TIGHTLY CLOSED & AWAY FROM HEAT, SPARKS & OPEN FLAME. PRODUCT IS HYGROSCOPIC. STORE IN A COOL DRY PLACE. NO SMOKING. CANNOT BE MADE NON-POISONOUS
Other Precautions: AVOID CONTACT W/EYES, SKIN, CLOTHING & BREATHING OF VAPORS. DON'T USE IF SKIN IS CUT OR SCRATCHED.

## Control Measures

Respiratory Protection: WEAR AN APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: MECHANICAL EXHAUST
Protective Gloves: CHEMICAL RESISTANT
Eye Protection: SAFETY GOGGLES
Other Protective Equipment: RUBBER BOOTS, SAFETY SHOWER, EYE BATH
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.

## Transportation Data

## Disposal Data

## Label Data

Label Required: YES
Technical Review Date: 30SEP93
Label Date: 17SEP93
Label Status: F
Common Name: 65550 METHANOL
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-Severe: X
Reactivity Hazard-Slight: X
Special Hazard Precautions: MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR OR MIST IS IRRITATING TO THEY EYES, MUCOUS MEMBRANES, SKIN, & UPPER RESPIRATORY TRACT. CAN CAUSE DAMAGE TO THE EYES, LIVER, HEART, KIDNEYS. GASTROINTESTINAL DISTURBANCES & CONVULSIONS. MAY CAUSE BLINDNESS IF INGESTED. TARGET ORGANS: EYES, SKIN, LIVER, HEART, KIDNEYS, RESPIRATORY & DIGESTIVE TRACTS. DIGESTIVE TRACTS, LIVER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO SUB OF SIGMA-ALDRICH
Label Street: 1001 W ST PAUL AVE
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: WI
Label Zip Code: 53233
Label Country: US
Label Emergency Number: 800-325-5832-S/800-231-8327-A
Year Procured: UNK

ALDRICH CHEMICAL -- HEXANE ACS GRADE - N-HEXANE
MATERIAL SAFETY DATA SHEET
NSN: 681000N040300
Manufacturer's CAGE: 60928
Part No. Indicator: A
Part Number/Trade Name: HEXANE ACS GRADE

## General Information

Item Name: N-HEXANE
Company's Name: ALDRICH CHEMICAL CO
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53201
Company's Emerg Ph #: 414-273-3850
Company's Info Ph #: 414-273-3850
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 04AUG92
Safety Data Review Date: 03MAR93
MSDS Serial Number: BRZJT
Hazard Characteristic Code: NK

## Ingredients/Identity Information

Proprietary: NO
Ingredient: HEXANE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: MN9275000
CAS Number: 110-54-3
OSHA PEL: 500 PPM
ACGIH TLV: 50 PPM; 9293

## Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID
Boiling Point: 154F,68C
Vapor Pressure (MM Hg/70 F): 132@20C
Vapor Density (Air=1): 3
Specific Gravity: 0.661

## Fire and Explosion Hazard Data

Flash Point: -10F,-23C
Lower Explosive Limit: 1.2%
Upper Explosive Limit: 7.7%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS.
Unusual Fire And Expl Hazrds: VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK. CONTAINER EXPLOSION MAY OCCUR UNDER FIRE CONDITIONS. EXTREMELY FLAMMABLE.

## Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS AND OPEN FLAME.
Materials To Avoid: OXIDIZING AGENTS. CHLORINE, FLUORINE, MAGNESIUM PERCHLORATGE.
Hazardous Decomp Products: TOXIC FUMES OF: CARBON MONOXIDE, CARBON DIOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

## Health Hazard Data

LD50-LC50 Mixture: LD50:(ORAL,RAT)28710 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE: HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THRU SKIN. VAPOR OR MIST IS IRRITATING TO EYES, MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT. CAUSES SKIN IRRITATION. MAY CAUSE NERVOUS SYSTEM DISTURBANCES. EXPOSURE CAN CAUSE: COUGHING, CHEST PAINS, DIFFICULTY IN BREATHING. LUNG IRRIT, CHEST PAIN (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ: & EDEMA WHICH MAY BE FATAL. GI DISTURBANCES, NAUSEA, HEADACHE AND VOMITING.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES: IMMED FLUSH W/COPIOUS AMTS OF WATER FOR @ LST 15 MIN & SEEK MED ADVICE. SKIN: IMMED FLUSH W/COPIOUS AMTS OF WATER FOR @ LST 15 MIN WHILE REMOVING CONTAMD CLTHG & SHOES. WASH CONTAMD CLTHG BEFORE REUSE. INHAL: REMOVE TO FRESH AIR. IF NOT BRTHG GIVE ARTF RESP. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGEST: WASH OUT MOUTH W/ WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN.

## Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVAC AREA. SHUT OFF ALL SOURCES OF IGNIT. WEAR NIOSH/MSHA APPRVD SCBA, RUBB BOOTS & HEAVY RUBB GLOVES. COVER W/AN ACTIVATED CARBON ABSORB, TAKE UP & PLACE IN CLSD CONTRS. TRANSPORT OUTDOORS. VENT AREA & WASH SPILL SITE AFTER MATL PICKUP IS COMPLETE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS THIS MATERIAL IS HIGHLY FLAMMABLE. OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.
Precautions-Handling/Storing: KEEP TIGHTLY CLSD. STORE IN A COOL DRY PLACE. DO NOT BREATHE VAP. AVOID CONT W/EYES/SKIN/CLTHG. IRRITANT. HARMFUL VAP. NEUROLOGICAL HAZARD.
Other Precautions: KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.

## Control Measures

Respiratory Protection: WEAR APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: USE ONLY IN A CHEMICAL FUME HOOD.

Protective Gloves: CHEMICAL-RESISTANT GLOVES.
Eye Protection: CHEMICAL SAFETY GOGGLES.
Other Protective Equipment: OTHER PROTECTIVE CLOTHING, SAFETY SHOWER AND EYE BATH.
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: NONE SPECIFIED BY MANUFACTURER.

## Transportation Data

## Disposal Data

## Label Data

Label Required: YES
Technical Review Date: 03MAR93
Label Date: 03MAR93
Label Status: G
Common Name: HEXANE ACS GRADE
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Slight: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: STORE IN A COOL DRY PLACE. DO NOT BREATHE VAPOR. AVOID CONTACT W/EYES/SKIN/CLTHG. IRRITANT. HARMFUL VAPOR. HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THRU SKIN. VAPOR/MIST IS IRRITATING TO EYES, MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT. CAUSES COUGHING, CHEST PAINS, DIFFICULTY IN BREATHING, LUNG IRRITATION, CHEST PAIN & EDEMA WHICH MAY BE FATAL. GI DISTURBANCES, NAUSEA, HEADACHE AND VOMITING.
CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: WI
Label Zip Code: 53201
Label Country: US
Label Emergency Number: 414-273-3850

GEORGIA STEEL & CHEMICAL -- FK300 SPECIAL RESPIRATOR CLEANER PLUS -
QUATERNARY AMMONIUM GERMICIDAL DETERGENT DISINFECTANT
MATERIAL SAFETY DATA SHEET
NSN: 685000F046838
Manufacturer's CAGE: 3J051
Part No. Indicator: A
Part Number/Trade Name: FK300 SPECIAL RESPIRATOR CLEANER PLUS

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General Information

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Item Name: QUATERNARY AMMONIUM GERMICIDAL DETERGENT DISINFECTANT
Company's Name: GEORGIA STEEL & CHEMICAL CO INC
Company's Street: 10810 GUILFORD RD BAY 104
Company's City: ANNAPOLIS JUNCTION
Company's State: MD
Company's Country: US
Company's Zip Code: 20701-5000
Company's Emerg Ph #: 301-317-5502/800-296-0351
Company's Info Ph #: 800-296-0351/301-317-5502
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 01JAN96
Safety Data Review Date: 31MAY96
Preparer's Company: GEORGIA STEEL & CHEMICAL CO INC
Preparer's St Or P. O. Box: 10810 GUILFORD RD BAY 104
Preparer's City: ANNAPOLIS JUNCTION
Preparer's State: MD
Preparer's Zip Code: 20701-5000
MSDS Serial Number: BYNPW

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: QUATERNARY AMMONIUM COMPOUNDS, BENZYL-C12-18-ALKYLDIMETHYL, CHLORIDES *96-1*
Ingredient Sequence Number: 01
Percent: 5-10
NIOSH (RTECS) Number: 1001813QA
CAS Number: 68391-01-5

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Proprietary: NO
Ingredient: OCTYL DECYL DIMETHYL AMMONIUM CHLORIDE; N,N-DIMETHYL-N-OCTYL-1-DECANAMINIUM CHLORIDE; AMMONIUM, DECYLDIMETHYLOCTYL
Ingredient Sequence Number: 02
Percent: 1-5
NIOSH (RTECS) Number: HD6520000
CAS Number: 32426-11-2

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Proprietary: NO
Ingredient: DIDECYL DIMETHYL AMMONIUM CHLORIDE; DIMETHYLDIDECYLAMMONIUM CHLORIDE; BTC 1010; BARDAC 22
Ingredient Sequence Number: 03
Percent: 1-5
NIOSH (RTECS) Number: BP6560000
CAS Number: 7173-51-5

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Proprietary: NO
Ingredient: DIDECYL DIMETHYL AMMONIUM CHLORIDE
Ingredient Sequence Number: 04
Percent: 1-5
NIOSH (RTECS) Number: RG8250000
CAS Number: 5538-94-3

## Physical/Chemical Characteristics

Appearance And Odor: CLEAR BLUE LIQUID W/A PLEASANT SASSAFRAS ODOR.
Boiling Point: 212F
Vapor Pressure (MM Hg/70 F): AS WATER
Specific Gravity: 1.01
Evaporation Rate And Ref: (WATER =1): 1
Solubility In Water: COMPLETE

## Fire and Explosion Hazard Data

Flash Point: NONE TO BOILING
Flash Point Method: TCC
Special Fire Fighting Proc: NONE
Unusual Fire And Expl Hazrds: NONE

## Reactivity Data

Stability: YES
Cond To Avoid (Stability): DON'T MIX W/CLEANING CHEMICALS.
Materials To Avoid: STRONG OXIDIZING/REDUCING AGENTS.
Hazardous Decomp Products: AMMONIA, NITROGEN OXIDES.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE

## Health Hazard Data

Route Of Entry - Inhalation: NO
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
IRRITATION TO MUCOUS MEMBRANES. INGESTION: SEVERE IRRITATION TO MOUTH, THROAT, GI TRACT, CIRCULATORY SHOCK & RESPIRATORY DEPRESSION.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: REDNESS, TEARING, IRRITATION, BURNING IN MOUTH, THROAT, ABDOMEN, CIRCULATORY SHOCK, CONVULSIONS.
Med Cond Aggravated By Exp: DERMATITIS.
REMOVE TO FRESH AIR. SKIN: WASH W/MILD SOAP & WATER. OBTAIN MEDICAL ATTENTION IN ALL CASES. INGESTION: DON'T INDUCE VOMITING. GIVE PROMPTLY LARGE QUANTITIES OF EGG WHITES/GELATIN SOLUTION. IF UNAVAILABLE, DRINK LARGE QUANTITIES OF WATER. AVOID ALCOHOL. OBTAIN MEDICAL ATTENTION IN ALL CASES. NOTE TO PHYSICIAN: (SEE SUPP)

## Precautions for Safe Handling and Use

Steps If Matl Released/Spill: MOP UP/ABSORB/USE SOLID ABSORBENT & SHOVEL INTO CONTAINERS FOR DISPOSAL.
Waste Disposal Method: DISPOSE OF IAW/FEDERAL, STATE & LOCAL REGULATIONS.

Precautions-Handling/Storing: KEEP CONTAINER CLOSED WHEN NOT IN USE. DON'T REUSE EMPTY CONTAINER.
Other Precautions: KEEP AWAY FROM FOOD & WATER SUPPLIES. OPEN DUMPING IS PROHIBITED.

## Control Measures

Ventilation: MECHANICAL (GENERAL) IS SUFFICIENT
Protective Gloves: RUBBER/NEOPRENE
Eye Protection: GOGGLES
Other Protective Equipment: NONE

## Transportation Data

## Disposal Data

## Label Data

Label Required: YES
Label Status: G
Common Name: FK300 SPECIAL RESPIRATOR CLEANER
MAY CAUSE IRRITATION OF LUNGS & AIRWAYS. IRRITATION, STOMACH DISTRESS.
Label Name: GEORGIA STEEL & CHEMICAL CO INC
Label Street: 10810 GUILFORD RD BAY 104
Label City: ANNAPOLIS JUNCTION
Label State: MD
Label Zip Code: 20701-5000
Label Country: US
Label Emergency Number: 301-317-5502/800-296-0351

# Attachment 5

## Self Assessment Checklist

**CH2MHILL** ***JOBSITE SAFETY INSPECTION CHECKLIST*** Revision.: 03

STANDARD OF PRACTICE HS-18 - HEALTH AND SAFETY CHECKLIST Date: 05/01/98

Note: The following jobsite safety inspection checklist is to be used only at locations where CCI controls the work. It is not to be used at locations where others control the work.

Project Name: Site 4, Whiting Field Project No.: _____

Location: NAS Whiting Field Project Manager: John Custance

Inspector: _____ Date: _____

This checklist has been divided into two sections. The first section (I through XXVI) are applicable to all projects. The second section (XXVII through XXIX) addresses specific situations such as hazardous waste, construction activities, and office trailers. There may be some duplication between the first and second sections.

If an item is not applicable, the column titled "N/A" should be checked. If an item is applicable but the auditor does not observe it during the inspection, the "N/O" column should be checked. For each deficiency noted, a Health and Safety Audit Finding Form must be completed. The Corporate Health and Safety Director must be copied on the results of all audits.

| Check "Yes" for Items Completed | Yes | No | N/A | N/O |
|---|---|---|---|---|
| **I. JOBSITE OFFICE** | | | | |
| 1. Posters and safety signs in place: | | | | |
| a. OSHA safety poster | ☐ | ☐ | ☐ | ☐ |
| b. Emergency Telephone Number Form | ☐ | ☐ | ☐ | ☐ |
| c. Workers Compensation Form | ☐ | ☐ | ☐ | ☐ |
| 2. First aid kit: | | | | |
| a. Fully stocked/sufficient supply | ☐ | ☐ | ☐ | ☐ |
| b. First-aid administered by a person with a valid certificate | ☐ | ☐ | ☐ | ☐ |
| 3. Bloodborne-pathogen kit | ☐ | ☐ | ☐ | ☐ |
| 4. Accident/injury reporting: | | | | |
| a. Employees briefed | ☐ | ☐ | ☐ | ☐ |
| b. Forms available | ☐ | ☐ | ☐ | ☐ |
| c. Injuries and illnesses reported and logged | ☐ | ☐ | ☐ | ☐ |
| d. Accidents investigated and properly followed up to prevent | ☐ | ☐ | ☐ | ☐ |
| e. Accident reports and logs submitted promptly as required | ☐ | ☐ | ☐ | ☐ |

| | | | | | |
|---|---|---|---|---|---|
| 5. | Job safety rules and regulations available/posted | ☐ | ☐ | ☐ | ☐ |
| **II.** | **HAZARD COMMUNICATION** | | | | |
| 1. | Employee training: | | | | |
| | a. Employees' signed training certificates on file | ☐ | ☐ | ☐ | ☐ |
| 2. | Material safety data sheets (MSDSs): | | | | |
| | a. MSDSs on file | ☐ | ☐ | ☐ | ☐ |
| | b. Log assigned to competent person | ☐ | ☐ | ☐ | ☐ |
| | c. Log complete and up to date | ☐ | ☐ | ☐ | ☐ |
| 3. | Written program on file | ☐ | ☐ | ☐ | ☐ |
| **III.** | **EMPLOYEE TRAINING** | | | | |
| 1. | Safety indoctrination held for new employees | ☐ | ☐ | ☐ | ☐ |
| 2. | Sufficient instruction given in recognition and avoidance of job hazards; unsafe conditions; and job rules, regulations, and procedures | ☐ | ☐ | ☐ | ☐ |
| 3. | Sufficient instruction in proper use and maintenance of tools, equipment, and personal protective equipment | ☐ | ☐ | ☐ | ☐ |
| 4. | Employees instructed to report unsafe or hazardous conditions to proper job supervisor | ☐ | ☐ | ☐ | ☐ |
| 5. | Employees instructed to promptly report injury, illness, and accidents involving damage to equipment and materials | ☐ | ☐ | ☐ | ☐ |
| 6. | All site personnel have read the job safety rules and regulations and have signed the "Employee Signoff Sheet" | ☐ | ☐ | ☐ | ☐ |
| **IV.** | **JOBSITE LOGISTICS AND LAYOUT** | | | | |
| 1. | Traffic routes around construction areas: | | | | |
| | a. Warning signs, flagging in place | ☐ | ☐ | ☐ | ☐ |
| 2. | Trucks and heavy equipment: | | | | |
| | a. Good mechanical conditions | ☐ | ☐ | ☐ | ☐ |
| | b. Backup signals working | ☐ | ☐ | ☐ | ☐ |
| | c. Seat belts installed and used | ☐ | ☐ | ☐ | ☐ |
| **V.** | **PUBLIC PROTECTION** | | | | |
| 1. | Warning signs in place around site | ☐ | ☐ | ☐ | ☐ |
| **VI.** | **HOUSEKEEPING** | | | | |
| 1. | Material storage yard: | | | | |
| | a. Stacked neatly and properly | ☐ | ☐ | ☐ | ☐ |
| | b. Aisles, walkways, roads clear | ☐ | ☐ | ☐ | ☐ |
| 2. | Check work areas for: | | | | |
| | a. Loose and waste materials | ☐ | ☐ | ☐ | ☐ |
| | b. Trash cans, dumpsters available and emptied regularly | ☐ | ☐ | ☐ | ☐ |

| | | | | | |
|---|---|---|---|---|---|
| c. | Nails, boards, debris removed | ☐ | ☐ | ☐ | ☐ |
| d. | Trash receptacles provided for drinking cups | ☐ | ☐ | ☐ | ☐ |
| **VII.** | **PERSONAL PROTECTIVE EQUIPMENT (PPE)** | | | | |
| 1. | Hard hats | ☐ | ☐ | ☐ | ☐ |
| 2. | Safety shoes/boots | ☐ | ☐ | ☐ | ☐ |
| 3. | Eye/face protection | ☐ | ☐ | ☐ | ☐ |
| 4. | Safety belts/lanyards | ☐ | ☐ | ☐ | ☐ |
| 5. | Ear protection: | | | | |
| a. | Noise level areas of 90 dBA and above identified | ☐ | ☐ | ☐ | ☐ |
| b. | Signs notifying personnel of "Hearing Protection Required" posted | ☐ | ☐ | ☐ | ☐ |
| 6. | Specialized equipment: | | | | |
| a. | Gloves | ☐ | ☐ | ☐ | ☐ |
| b. | Chemical-Respirators (respirator use requires medical protocol, monitoring and training) | ☐ | ☐ | ☐ | ☐ |
| c. | Chemical-resistant clothing | ☐ | ☐ | ☐ | ☐ |
| 7. | Tools: | | | | |
| a. | Handles in good shape | ☐ | ☐ | ☐ | ☐ |
| b | Tool guards in place | ☐ | ☐ | ☐ | ☐ |
| c. | Proper tools used for the job | ☐ | ☐ | ☐ | ☐ |
| d. | Tools maintained in functional condition (hammer heads not mushroomed) | ☐ | ☐ | ☐ | ☐ |
| **VIII.** | **SANITATION** | | | | |
| 1. | Temporary toilets: | | | | |
| a. | Serviced regularly | ☐ | ☐ | ☐ | ☐ |
| b. | Sufficient Quantity (20 or fewer employees - 1 required; 20 or more employees - 1 toilet and 1 urinal per 40 workers | ☐ | ☐ | ☐ | ☐ |
| 2. | Potable Water: | | | | |
| a. | Tightly closed containers | ☐ | ☐ | ☐ | ☐ |
| b. | Equipped with tap | ☐ | ☐ | ☐ | ☐ |
| c. | Paper cups available | ☐ | ☐ | ☐ | ☐ |
| d. | Containers labeled "Drinking Water" | ☐ | ☐ | ☐ | ☐ |
| **IX.** | **FLOOR AND WALL OPENINGS GUARDS** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **XI. SCAFFOLDING** | | | | | |
| **XII. ELECTRICAL** | | | | | |
| **XIII. TEMPORARY HEATERS** | | | | | |
| **XIV. FIRE PROTECTION** | | | | | |
| 1. Office fire extinguisher in working order and inspected regularly | ☐ | ☐ | ☐ | ☐ | |
| 2. One extinguisher, 2A rating, for each 3,000 square feet of protected area | ☐ | ☐ | ☐ | ☐ | |
| 3. One extinguisher, 2A rating, on each floor adjacent to each stairway | ☐ | ☐ | ☐ | ☐ | |
| 4. Trash, paper, other combustibles picked up | ☐ | ☐ | ☐ | ☐ | |
| 5. Welders/roofers have extinguishers nearby and a fire watch is available if needed | ☐ | ☐ | ☐ | ☐ | |
| 6. Fire alarm available/fire evacuation plan | ☐ | ☐ | ☐ | ☐ | |
| 7. "No Smoking" signs posted and enforced where necessary | ☐ | ☐ | ☐ | ☐ | |
| 8. Supervisors and employees trained in proper use of extinguishers | ☐ | ☐ | ☐ | ☐ | |
| **XV. MATERIAL STORAGE AND HANDLING** | | | | | |
| 1. Neat storage area, clear passageways | ☐ | ☐ | ☐ | ☐ | |
| 2. Materials spotted to minimize rehandling and reduce transport distances | ☐ | ☐ | ☐ | | |
| 3. Power equipment used to handle heavy/awkward loads | ☐ | ☐ | ☐ | ☐ | |
| 4. Stacks on firm footing and all tier stacked materials secured against sudden movement | ☐ | ☐ | ☐ | ☐ | |
| 5. Storage platforms, skids, bins, shelves, etc. in good repair | ☐ | ☐ | ☐ | ☐ | |
| 6. Protruding nails and wires removed and rugged metal edges protected before material is handled | ☐ | ☐ | ☐ | ☐ | |
| 7. Lifting weights known before handling | ☐ | ☐ | ☐ | ☐ | |
| 8. Employees using proper lifting methods, picking up loads correctly | ☐ | ☐ | ☐ | ☐ | |
| 9. Proper number of employees for each operation, physically suited for task | ☐ | ☐ | ☐ | ☐ | |
| **XVI. DEMOLITION WORK** | | | | | |
| **XVII. STEEL ERECTION** | | | | | |
| **XX. FLAMMABLE AND COMBUSTIBLE LIQUIDS** | | | | | |
| 1. All containers clearly marked to show contents (gas cylinders, cans, drums, fuel tanks, etc.) | ☐ | ☐ | ☐ | ☐ | |
| 2. Proper storage practices observed: | | | | | |
| a. Storage areas enclosed or protected from heat and mobile equipment exposure | ☐ | ☐ | ☐ | | |

| | | | | | |
|---|---|---|---|---|---|
| b. | Fire hazards checked | ☐ | ☐ | ☐ | ☐ |
| c. | Sufficient fire extinguishers | ☐ | ☐ | ☐ | ☐ |
| d. | UL approved safety cans for 1 to 5 gallons of flammable liquids | ☐ | ☐ | ☐ | ☐ |
| e. | Approved cabinet for indoor storage of liquids in excess of 25-gallons, but not more than 120-gallon storage | ☐ | ☐ | ☐ | ☐ |
| f. | Sign labeled "Flammable - Keep Fire Away" posted on cabinet | ☐ | ☐ | ☐ | ☐ |

## XXI. FLAMMABLE GAS (Oxygen/Acetylene)

| | | | | | |
|---|---|---|---|---|---|
| 1. | Cylinders: | | | | |
| a. | Away from heat | ☐ | ☐ | ☐ | ☐ |
| b. | Stored upright (secured) | ☐ | ☐ | ☐ | ☐ |
| c. | Valves closed on empty cylinders | ☐ | ☐ | ☐ | ☐ |
| d. | Valve protection caps in place if cylinder not in use | ☐ | ☐ | ☐ | ☐ |
| e. | Valve key wrench available | ☐ | ☐ | ☐ | ☐ |
| f. | Portable rack with bottles secured | ☐ | ☐ | ☐ | ☐ |
| g. | Instruct project staff to never drag or slide bottles | ☐ | ☐ | ☐ | ☐ |
| h. | Designated storage area | ☐ | ☐ | ☐ | ☐ |
| i. | "No Smoking" signs posted | ☐ | ☐ | ☐ | ☐ |
| j. | Oxygen bottles stored 20' from acetylene bottles or 1/2-hour fire barrier installed between them | ☐ | ☐ | ☐ | ☐ |
| 2. | Gauges/valves/hoses: | ☐ | ☐ | ☐ | ☐ |
| a. | Good condition | ☐ | ☐ | ☐ | ☐ |
| b. | Fire arresters installed (both hoses) | ☐ | ☐ | ☐ | ☐ |
| 3. | Eye protection available | ☐ | ☐ | ☐ | ☐ |
| 4. | Ventilation adequate | ☐ | ☐ | ☐ | ☐ |
| 5. | When in use, gas lines properly located to prevent tripping and falling | ☐ | ☐ | ☐ | ☐ |
| 6. | All burning torches bled and free of oxygen and acetylene and/or other gases during lunch breaks and other extended periods of time | ☐ | ☐ | ☐ | ☐ |

## XXII. WELDING OPERATIONS

| | | | | | |
|---|---|---|---|---|---|
| 1. | Performed by qualified personnel | ☐ | ☐ | ☐ | |
| 2. | Screens, shields, or eye protection provided and used to protect employees from welding operation | ☐ | ☐ | ☐ | ☐ |
| 3. | Employees wear sufficient clothing and PPE | ☐ | ☐ | ☐ | ☐ |
| 4. | Equipment checked before use and in operative conditions | ☐ | ☐ | ☐ | ☐ |
| 5. | Electrical equipment grounded | ☐ | ☐ | ☐ | ☐ |
| 6. | Power cables protected and in good repair | ☐ | ☐ | ☐ | ☐ |
| 7. | Power cables properly located to prevent tripping and falling hazards | ☐ | ☐ | ☐ | ☐ |
| 8. | Dry chemical fire extinguisher within 30 feet | ☐ | ☐ | ☐ | ☐ |
| 9. | Exposed combustible materials removed to safe location or properly protected from sparks and slag | ☐ | ☐ | ☐ | ☐ |
| 10. | Valid hot work permit required or provided | ☐ | ☐ | ☐ | ☐ |
| 11. | Overhead protection provided where required | ☐ | ☐ | ☐ | ☐ |
| 12. | "Danger - No Smoking, Matches or Open Lights" signs posted when required | ☐ | ☐ | ☐ | |
| 13. | Adequate lighting and ventilation provided | ☐ | ☐ | ☐ | ☐ |
| 14. | Machines turned off at end of shift or when not in use for extended periods | ☐ | ☐ | ☐ | ☐ |

## XXIII. HOISTS

## XXIV. BLASTING

## XXV. HAZARDOUS WASTE

**Certification and Training of CH2M HILL Personnel**

| | | | | | |
|---|---|---|---|---|---|
| 1. | Medical exam within last 12 months | ☐ | ☐ | ☐ | ☐ |
| 2. | 40-hour initial training, 3 days supervised field activities, 8-hour annual Refresher | ☐ | ☐ | ☐ | ☐ |
| 3. | First aid and CPR certification | ☐ | ☐ | ☐ | ☐ |
| 4. | Quantitatively fit tested (preferred method per NIOSH Publication 87-116, 87-116, Appendix B.3) | ☐ | ☐ | ☐ | ☐ |
| 5. | Attend pre-entry safety meeting | ☐ | ☐ | ☐ | ☐ |
| 6. | Site Safety Coordinator with appropriate training | ☐ | ☐ | ☐ | ☐ |

**Certification and Training of Subcontractor Personnel**

| | | | | | |
|---|---|---|---|---|---|
| 1. | Medical exam within last 12 months | ☐ | ☐ | ☐ | |
| 2. | 40-hour initial training, 3 days supervised field activities, 8-hour | ☐ | ☐ | ☐ | ☐ |

| | | | | | |
|---|---|---|---|---|---|
| | Annual refresher | | | | |
| 3. | First aid and CPR certification | ☐ | ☐ | ☐ | ☐ |
| 4. | Quantitatively fit tested (preferred method per NIOSH Publication 87-116, (Appendix B.3) | ☐ | ☐ | ☐ | ☐ |
| 5. | Attend pre-entry safety meeting | ☐ | ☐ | ☐ | ☐ |
| **Site Safety Documentation** | | | | | |
| 1. | Site health and safety plan (HSP) prepared and approved | ☐ | ☐ | ☐ | ☐ |
| 2. | HSP onsite | ☐ | ☐ | ☐ | ☐ |
| 3. | All personnel onsite identified in HSP | ☐ | ☐ | ☐ | ☐ |
| 4. | Documentation of safety briefing | ☐ | ☐ | ☐ | ☐ |
| 5. | Hospital map posted | ☐ | ☐ | ☐ | ☐ |
| 6. | Phone numbers posted | ☐ | ☐ | ☐ | ☐ |
| 7. | Emergency vehicle identified | ☐ | ☐ | ☐ | ☐ |
| 8. | Material Safety Data Sheets (MSDSs) onsite | ☐ | ☐ | ☐ | ☐ |
| 9. | Work zones delineated (How? _____) | ☐ | ☐ | ☐ | ☐ |
| 10. | Wind direction flags in use | ☐ | ☐ | ☐ | ☐ |
| 11. | Documentation of calibration of monitoring equipment in Clean environment | ☐ | ☐ | ☐ | ☐ |
| 12. | Monitoring conducted and recorded as specified in HSP (Frequency? _____) | ☐ | ☐ | ☐ | ☐ |
| 13. | Monitoring for heat/cold stress | ☐ | ☐ | ☐ | ☐ |
| 14. | Buddy system in use | ☐ | ☐ | ☐ | ☐ |
| 15. | Decontamination procedures established as specified in HSP | ☐ | ☐ | ☐ | ☐ |
| 16. | No eating, drinking, or smoking in exclusion and contamination Reduction zones | ☐ | ☐ | ☐ | ☐ |
| 17. | Toilet facilities provided | ☐ | ☐ | ☐ | ☐ |
| 18. | No contact lenses | ☐ | ☐ | ☐ | ☐ |
| 19. | Work conducted during daylight hours only | ☐ | ☐ | ☐ | ☐ |

**Safety Briefing**

| | | | | |
|---|---|---|---|---|
| 1. All personnel attended (including new personnel) | ☐ | ☐ | ☐ | |
| 2. Documentation of meetings | ☐ | ☐ | ☐ | ☐ |
| 3. Chemical hazards and toxicology reviewed | ☐ | ☐ | ☐ | ☐ |
| 4. Physical hazards reviewed | ☐ | ☐ | ☐ | ☐ |
| 5. Biological hazards reviewed | ☐ | ☐ | ☐ | ☐ |
| 6. Heat/cold stress information reviewed | ☐ | ☐ | ☐ | ☐ |
| 7. Air monitoring requirements | ☐ | ☐ | ☐ | ☐ |
| 8. Levels of protection reviewed | ☐ | ☐ | ☐ | ☐ |
| 9. Work zones reviewed | ☐ | ☐ | ☐ | ☐ |
| 10. Decontamination procedures reviewed | ☐ | ☐ | ☐ | ☐ |
| 11. Emergency response procedures reviewed | ☐ | ☐ | ☐ | ☐ |
| 12. Site communications | ☐ | ☐ | ☐ | |
| **Personal Protective Equipment (PPE)** | | | | |
| 1. Levels of protection being worn as specified in HSP | ☐ | ☐ | ☐ | |
| 2. All appropriate PPE available onsite | ☐ | ☐ | ☐ | ☐ |
| 3. Hard hats being worn | ☐ | ☐ | ☐ | ☐ |
| 4. Appropriate hand protection being used (What? _____ ) | ☐ | ☐ | ☐ | ☐ |
| 5. Appropriate body protection being used (What? _____ ) | ☐ | ☐ | ☐ | ☐ |
| 6. Appropriate eye protection being used (What? _____ ) | ☐ | ☐ | ☐ | ☐ |
| 7. Appropriate ear protection being used | ☐ | ☐ | ☐ | ☐ |
| 8. Appropriate respirator protection being used | ☐ | ☐ | ☐ | ☐ |
| 9. Respirators donned correctly | ☐ | ☐ | ☐ | ☐ |
| **Decontamination Procedures** | | | | |
| 1. Decontamination procedure established as specified in the HSP | ☐ | ☐ | ☐ | |

2. Decontamination zone clearly defined ☐ ☐ ☐ ☐

3. PPE properly decontaminated ☐ ☐ ☐ ☐
(How? _____ )

4. Sampling equipment properly decontaminated ☐ ☐ ☐ ☐
(How? _____ )

5. Monitoring equipment properly decontaminated ☐ ☐ ☐ ☐
(How? _____ )

6. Heavy equipment properly decontaminated ☐ ☐ ☐ ☐
(How? _____ )

7. Samples properly decontaminated ☐ ☐ ☐ ☐
(How? _____ )

8. Decontamination fluids appropriately disposed of ☐ ☐ ☐ ☐

## XXVI. CONSTRUCTION INSPECTIONS

## XXVII. OFFICE TRAILERS/BUILDINGS

**Employer Posting**

1. Is the OSHA (or state) job safety poster displayed in a prominent location where all employees are likely to see it? ☐ ☐ ☐ ☐
2. Are emergency telephone numbers posted where they can be readily found in case of emergency? ☐ ☐ ☐ ☐
3. Where employees may be exposed to any toxic substances or harmful physical agents, has appropriate information concerning employee access to medical and exposure records and Material Safety Data Sheets been posted or otherwise made readily available to affected employees? ☐ ☐ ☐ ☐
4. Are signs concerning exiting from buildings, room capacities, floor loading, exposures to x-ray, microwave, or other harmful radiation or substances posted where appropriate? ☐ ☐ ☐ ☐
5. Are other required posters properly displayed, such as:
   a. Industrial Welfare Commission orders regulating wages, hours, and working conditions? ☐ ☐ ☐ ☐
   b. Discrimination in employment prohibited by law? ☐ ☐ ☐ ☐
   c. Notice to employees of unemployment and disability insurance. ☐ ☐ ☐ ☐
   d. Payday notice? ☐ ☐ ☐ ☐

**Emergency Action Plan**

1. Are alarm systems properly maintained and tested regularly? ☐ ☐ ☐ ☐
2. Is the emergency action plan reviewed and revised periodically? ☐ ☐ ☐ ☐
3 Do employees know their responsibilities: ☐ ☐ ☐ ☐

a. For reporting emergencies? ☐ ☐ ☐

b. During an emergency? ☐ ☐ ☐ ☐

c. For conducting rescue and medical duties? ☐ ☐ ☐ ☐

**Fire Protection**

1. Is there a current fire prevention plan? ☐ ☐ ☐ ☐
2. Does the plan describe the type of fire protection equipment and/or ☐ ☐ ☐ ☐
3. Are practices and procedures established to control potential fire hazards and ignition sources? ☐ ☐ ☐ ☐
4. Is local fire department well acquainted with facilities, location, and specific hazards? ☐ ☐ ☐ ☐
5. Is there a fire alarm system and is it certified as required? ☐ ☐ ☐ ☐
6. If you have a fire alarm system, is it tested at least annually? ☐ ☐ ☐ ☐
7. Are fire doors and shutters in good operating condition? ☐ ☐ ☐ ☐
8. Are automatic sprinkler system water control valves, air and water pressures checked weekly/periodically as required? ☐ ☐ ☐ ☐
9. Is maintenance of automatic sprinkler systems assigned to responsible persons or to a sprinkler contractor? ☐ ☐ ☐
10. Is an earthquake preparedness kit on site? ☐ ☐ ☐ ☐

**Exiting or Egress**

1. Are all exits marked with an exit sign and illuminated by a reliable light source? ☐ ☐ ☐ ☐
2. Are the directions to exits, when not immediately apparent, marked with visible signs? ☐ ☐ ☐ ☐
3. Are doors, passageways, or stairways that are neither exits nor access to exits and which could be mistaken for exits, appropriately marked "NOT AN EXIT," "TO BASEMENT," "STOREROOM," etc.? ☐ ☐ ☐ ☐
4. Are exit doors side-hinged? ☐ ☐ ☐ ☐
5. Are all exits kept free of obstructions? ☐ ☐ ☐ ☐
6. Are there sufficient exits to permit prompt escape in case of emergency? ☐ ☐ ☐ ☐
7. Are special precautions taken to protect employees during construction and repair operations? ☐ ☐ ☐ ☐
8. Where exiting will be through frameless glass door, glass exit doors, etc., and the doors fully tempered, and do they meet the safety requirements for human impact? ☐ ☐ ☐ ☐

**<u>General Work Environment</u>**

1. Are all work sites clean and orderly? ☐ ☐ ☐

| | | | | | |
|---|---|---|---|---|---|
| 2. | Are work surfaces kept dry or appropriate means taken to assure the surfaces are slip-resistant? | ☐ | ☐ | ☐ | ☐ |
| 3. | Are all spilled materials or liquids cleaned up immediately? | ☐ | ☐ | ☐ | ☐ |
| 4. | Are the minimum number of toilets and washing facilities provided? | ☐ | ☐ | ☐ | ☐ |
| 5. | Are all toilets and washing facilities clean and sanitary? | ☐ | ☐ | ☐ | ☐ |
| 6. | Are all work areas adequately illuminated? | ☐ | ☐ | ☐ | ☐ |

**Walkways**

| | | | | | |
|---|---|---|---|---|---|
| 1. | Are aisles and passageways kept clear? | ☐ | ☐ | ☐ | ☐ |
| 2. | Are aisles and walkways marked as appropriate? | ☐ | ☐ | ☐ | ☐ |
| 3. | Are wet surfaces covered with nonslip materials? | ☐ | ☐ | ☐ | ☐ |
| 4. | Are holes in the floor, sidewalk, or other walking surface repaired Properly, covered, or otherwise made safe? | ☐ | ☐ | ☐ | ☐ |

**Medical Services And First Aid**

| | | | | | |
|---|---|---|---|---|---|
| 1. | If medical and first aid facilities are not in proximity to your workplace, is At least one employee on each shift currently qualified to render first aid? | ☐ | ☐ | ☐ | ☐ |
| 2. | Are medical personnel readily available for advice and consultation on Matters of employee health? | ☐ | ☐ | ☐ | ☐ |
| 3. | Are emergency phone numbers posted? | ☐ | ☐ | ☐ | ☐ |
| 4. | Are first aid kits easily accessible to each work area, with necessary Supplies available, periodically inspected, and replenished as needed? | ☐ | ☐ | ☐ | ☐ |
| 5. | Have first aid kit supplies been approved by a physician, indicating they are adequate for a particular area or operation? | ☐ | ☐ | ☐ | ☐ |

*XXIII. CONFINED SPACE ENTRY*
*XXIX. STAIRWAYS AND LADDERS*
*XXX. FALL PROTECTION*
*XXXI. EXCAVATIONS*
*XXXII. DRILLING*

**Personnel Safe Work Practices. (3.1)**

| | | | | | |
|---|---|---|---|---|---|
| 1. | Only authorized personnel operating drill rig. | ☐ | ☐ | ☐ | ☐ |
| 2. | Personnel cleared during rig startup. | ☐ | ☐ | ☐ | ☐ |
| 3. | Personnel clear of rotating parts. | ☐ | ☐ | ☐ | ☐ |
| 4. | Personnel not positioned under hoisted loads. | ☐ | ☐ | ☐ | ☐ |
| 5. | Loose clothing and jewelry removed. | ☐ | ☐ | ☐ | ☐ |

| | | | | |
|---|---|---|---|---|
| 6. Personnel instructed not to approach equipment that has become electrically energized. | ☐ | ☐ | ☐ | |
| 7. Smoking is prohibited around drilling operation. | ☐ | ☐ | ☐ | ☐ |
| 8. Personnel wearing appropriate PPE, per HSP. | ☐ | ☐ | ☐ | ☐ |
| **General (3.2.1)** | | | | |
| 9. Daily safety briefing/meeting conducted with crew. | ☐ | ☐ | ☐ | ☐ |
| 10. Daily inspection of drill rig and equipment conducted before use. | ☐ | ☐ | ☐ | ☐ |
| **Drill Rig Placement (3.2.2)** | | | | |
| 11. Location of underground utilities identified. | ☐ | ☐ | ☐ | ☐ |
| 12. Safe clearance distance maintained from overhead powerlines. | ☐ | ☐ | ☐ | ☐ |
| 13. Drilling pad established, when necessary. | ☐ | ☐ | ☐ | ☐ |
| 14. Drill rig leveled and stabilized. | ☐ | ☐ | ☐ | ☐ |
| **Drill Rig Travel (3.2.3)** | | | | |
| 15. Rig shut down and mast lowered and secured prior to rig movement. | ☐ | ☐ | ☐ | ☐ |
| 16. Tools and equipment secured prior to rig movement. | ☐ | ☐ | ☐ | ☐ |
| 17. Only personnel seated in cab are riding on rig during movement. | ☐ | ☐ | ☐ | |
| 18. Safe clearance distance maintained while traveling under overhead powerlines. | ☐ | ☐ | ☐ | ☐ |
| 19. Backup alarm or spotter used when backing rig. | ☐ | ☐ | ☐ | ☐ |
| **Drill Rig Operation (3.2.4)** | | | | |
| 20. Kill switch clearly identified and operational. | ☐ | ☐ | ☐ | ☐ |
| 21. All machine guards are in place. | ☐ | ☐ | ☐ | ☐ |
| 22. Rig ropes not wrapped around body parts. | ☐ | ☐ | ☐ | ☐ |
| 23. Pressurized lines and hoses secured from whipping hazards. | ☐ | ☐ | ☐ | ☐ |
| 24. Drill operation stopped during inclement weather. | ☐ | ☐ | ☐ | ☐ |
| 25. Air monitoring conducted per HSP for hazardous atmospheres. | ☐ | ☐ | ☐ | ☐ |
| 26. Rig placed in neutral when operator not at controls. | ☐ | ☐ | ☐ | ☐ |
| **Drill Rig Maintenance (3.2.5)** | | | | |
| 27. Defective components repaired immediately. | ☐ | ☐ | ☐ | ☐ |
| 28. Lockout/tagout procedures used prior to maintenance. | ☐ | ☐ | ☐ | |
| 29. Cathead in clean, sound condition. | ☐ | ☐ | ☐ | ☐ |

30. Drill rig ropes and wire lines in clean, sound condition ☐ ☐ ☐ ☐

31. Fall protection used for exposures > 6'. ☐ ☐ ☐ ☐

32. Rig in neutral and augers stopped rotating before cleaning. ☐ ☐ ☐ ☐

33. Good housekeeping maintained on and around rig. ☐ ☐ ☐ ☐

**Drilling at Hazardous Waste Sites (3.2.6)**

34. Waste disposal according to HSP and Environmental Protection Plan. ☐ ☐ ☐ ☐

35. Appropriate decontamination procedures followed, per HSP> ☐ ☐ ☐ ☐

## *XXXIII. EARTHMOVING EQUIPMENT*
## *XXXIV. DEMOLITION*
## *XXXVI. HAND AND POWER TOOLS*

**SAFE WORK PRACTICES (3.1)**

1. All tools operated according to manufacture's instructions. ☐ ☐ ☐ ☐

2. All hand and power tools maintained in a safe condition and inspected before each use. ☐ ☐ ☐ ☐

3. Defective tools are tagged and removed from service until repaired. ☐ ☐ ☐ ☐

4. PPE is selected and used according to tool-specific hazards. ☐ ☐ ☐ ☐

5. Power tools are not carried or lowered by cord or hose. ☐ ☐ ☐ ☐

6. Tools are disconnected from energy sources when not in use. ☐ ☐ ☐ ☐

7. Safety guards remain installed or are promptly replaced after repair. ☐ ☐ ☐ ☐

8. Tools are stored properly. ☐ ☐ ☐ ☐

9. Cordless tools and recharging units conform to electrical standards. ☐ ☐ ☐ ☐

10. Tools used in explosive environments are rated for such use. ☐ ☐ ☐ ☐

11. Knife or blade hand tools are used with the proper precautions. ☐ ☐ ☐ ☐

12. Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stresses. ☐ ☐ ☐ ☐

**General (3.2.1)**

13. PPE is selected and used according to tool-specific hazards anticipated. ☐ ☐ ☐ ☐

14. Tools are tested daily to assure safety devices are operating properly. ☐ ☐ ☐ ☐

15. Damaged tools are removed from service until repaired. ☐ ☐ ☐ ☐

16. Power operated tools designed to accommodate guards and used. ☐ ☐ ☐ ☐

17. Rotating or moving parts on tools are properly guarded. ☐ ☐ ☐ ☐

18. Machines designed for fixed locations are secured or anchored. ☐ ☐ ☐ ☐

19. Floor and bench-mounted grinders are provided with work rests. ☐ ☐ ☐ ☐

20. Guards are provided at point of operation, nip points, rotating parts. ☐ ☐ ☐ ☐

21. Fluid used in hydraulic-powered tools is approved fire-resistant fluid. ☐ ☐ ☐ ☐

**Electric-Powered Tools (3.2.2)**

22. Electric tools are double insulated or grounded according to SOP HS-23. ☐ ☐ ☐ ☐

23. Electric cords are not used for hoisting or lowering tools ☐ ☐ ☐ ☐

24. Hand-held tools are equipped with appropriate on/off controls. ☐ ☐ ☐ ☐

25. Electric tools used in damp/wet locations are approved or use GFCI. ☐ ☐ ☐ ☐

26. Portable, power-driven circular saws are equipped with proper guards. ☐ ☐ ☐ ☐

**Abrasive Wheel Tools (3.2.3)**

27. Employees using abrasive wheel tools are wearing eye protection. ☐ ☐ ☐ ☐

28. Grinding machines are supplied with sufficient power to maintain spindle speed. ☐ ☐ ☐ ☐

29. Abrasive wheels are closely inspected and ring-tested before use. ☐ ☐ ☐ ☐

30. Grinding wheels are properly installed. ☐ ☐ ☐ ☐

31. Cup-type wheels for external grinding are protected by proper guard. ☐ ☐ ☐ ☐

32. Portable abrasive wheels used for internal grinding are protected by safety flange. ☐ ☐ ☐ ☐

33. Safety flanges are used only with wheels designed to fit the flange. ☐ ☐ ☐ ☐

34. Safety guards on abrasive wheel tools are mounted properly. ☐ ☐ ☐ ☐

**Pneumatic-Powered Tools (3.2.4)**

35. Tools are secured to hoses or whip by positive means to prevent disconnect. ☐ ☐ ☐ ☐

36. Safety clips or retainers are installed to prevent attachments being expelled. ☐ ☐ ☐ ☐

37. Safety devices are installed on automatic fastener feed tools. ☐ ☐ ☐ ☐

38. Compressed air in not used for cleaning unless reduced to <30 psi, with PPE and guarded. ☐ ☐ ☐ ☐

39. Manufacturer's safe operating pressure for hoses, pipes, valves, are not exceeded. ☐ ☐ ☐ ☐
40. Hoses >1/2 inch diameter have safety device at source to reduce pressure upon hose failure. ☐ ☐ ☐ ☐
41. Airless spray guns have required safety devices installed. ☐ ☐ ☐ ☐
42. Blast cleaning nozzles are equipped with operating valves, which are held open manually. ☐ ☐ ☐ ☐
43. Supports are provided for mounting nozzles when not in use. ☐ ☐ ☐ ☐
44. Air receivers drains, handholes, and manholes are easily accessible. ☐ ☐ ☐ ☐
45. Air receivers are equipped with drainpipes, and valves for removal of Accumulated oil and water. ☐ ☐ ☐ ☐
46. Air receivers are completely drained at required intervals. ☐ ☐ ☐ ☐
47. Air receivers are equipped with indicating pressure gauges. ☐ ☐ ☐ ☐
48. Safety valves are tested at regular intervals for assure good operating condition. ☐ ☐ ☐ ☐
49. Safety, indicating, and controlling devices are installed as required. ☐ ☐ ☐ ☐

**Liquid Fuel-Powered Tools (3.2.5)**

50. Liquid fuel-powered tools are stopped when refueling, servicing, or for maintenance. ☐ ☐ ☐ ☐
51. Liquid fuels are stored, handled, and transported in accordance with SOP HS-21. ☐ ☐ ☐ ☐
52. Liquid fuel-powered tools are used in confined spaces in accordance with SOP HS-17 ☐ ☐ ☐ ☐
53. Safe operating pressures of hoses, valves, pipes, filters, and other Fittings are not exceeded. ☐ ☐ ☐ ☐

**Jacking Tools (3.2.6)**

54. Rated capacities are legibly marked on jacks and not exceeded. ☐ ☐ ☐ ☐
55. Jacks have a positive stop to prevent over-travel. ☐ ☐ ☐ ☐
56. Base of jacks are blocked or cribbed to provide a firm foundation. ☐ ☐ ☐ ☐
57. Wood blocks are placed between the cap and load to prevent slippage. ☐ ☐ ☐ ☐
58. After load is raised, it is cribbed, blocked, or otherwise secured Immediately. ☐ ☐ ☐ ☐
59. Antifreeze is used when hydraulic jacks are exposed to freezing temperatures. ☐ ☐ ☐ ☐
60. Jacks are properly lubricated. ☐ ☐ ☐ ☐
61. Jacks are inspected as required. ☐ ☐ ☐ ☐

62. Repair or replacement parts are examined for possible defects. ☐ ☐ ☐

63. Jacks not working properly are removed from service and repaired. ☐ ☐ ☐ ☐

Hand Tools(3.2.7)

64. Wrenches are not used when jaws are sprung to the point of slippage. ☐ ☐ ☐ ☐

65. Impact tools are kept free of mushroomed heads. ☐ ☐ ☐ ☐

66. Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool. ☐ ☐ ☐ ☐

XXXV. CONCRETE AND MASONARY
XXXVI. AERIAL LIFTS

# Appendix B

# Project Schedule

**The Project Schedule will be provided at a later date.**

# Appendix C

# Submittal Register

# Submittal Register

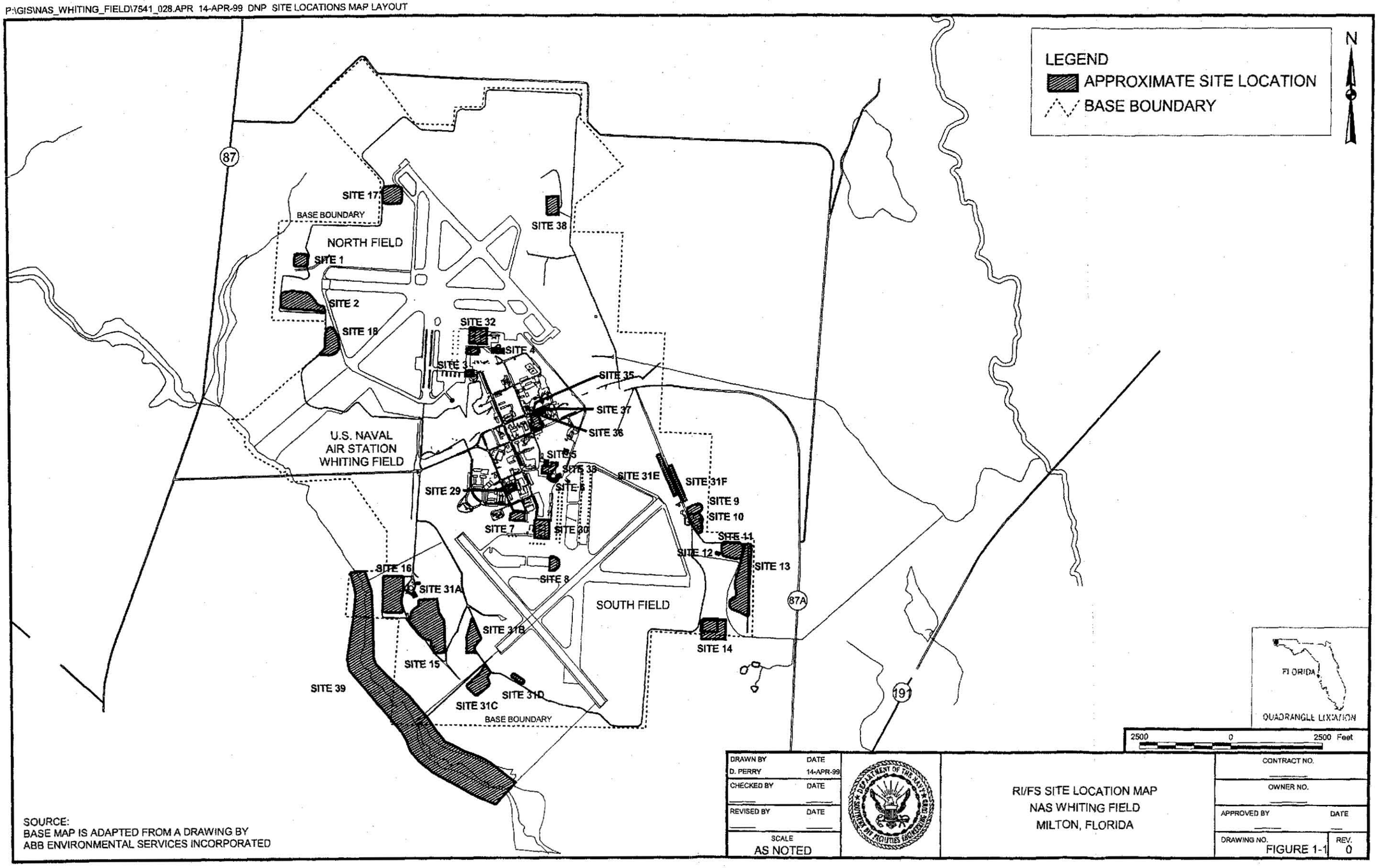
| Contract Number: N62467-98-D-0995 | | CTO No.: 0011 | | | CTO Title: NAS Whiting Field | | | | | Location: Milton, FL | | | | Contractor: CH2M HILL Constructors, Inc. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
| Spec Section | Item Description | Para. Number | Approving Authority | Other Reviewers | Submittal Number | Scheduled Submission Date | CCI Review Date | CCI Disposition | CCI Transmit Date | QC Admin Received Date | QC Disposition | QC Admin Transmit Date | Contracting Officer Received | Contracting Officer Disposition | Contracting Officer Return | Remarks |
| | | | | | | | | | | | | | | | | |
| | SD-02 **Manufacturer's Catalog Data** | | | | | | | | | | | | | | | |
| | SRS Well Systems | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | SD-07 **Schedules** | | | | | | | | | | | | | | | |
| | Construction Schedule | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | SD-09 **Reports** | | | | | | | | | | | | | | | |
| | Analytical Laboratory Reports | | | | | | | | | | | | | | | |
| | Construction Testing Lab Reports | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | SD-13 **Certificates** | | | | | | | | | | | | | | | |
| | Analytical Lab Certification | | | | | | | | | | | | | | | |
| | Construction Testing Lab Certification | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | SD-18 **Records** | | | | | | | | | | | | | | | |
| | As-Built Records | | | | | | | | | | | | | | | |
| | Contaminated Soil Disposal Manifests | | | | | | | | | | | | | | | |
| | Contaminated Water Disposal Manifests | | | | | | | | | | | | | | | |
| | Certificates of Disposal | | | | | | | | | | | | | | | |
| | Environmental Conditions Reports | | | | | | | | | | | | | | | |
| | Status Reports | | | | | | | | | | | | | | | |
| | List of Contractor Personnel | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

00781J01Z

# Appendix D

# Remedial Investigation Reference Drawings

P:\GIS\NAS_WHITING_FIELD\7541_028.APR 14-APR-99 DNP SITE LOCATIONS MAP LAYOUT




SOURCE:
BASE MAP IS ADAPTED FROM A DRAWING BY
ABB ENVIRONMENTAL SERVICES INCORPORATED

| | |
|---|---|
| DRAWN BY | DATE |
| D. PERRY | 14-APR-99 |
| CHECKED BY | DATE |
| | |
| REVISED BY | DATE |
| | |
| SCALE | |
| AS NOTED | |

RI/FS SITE LOCATION MAP
NAS WHITING FIELD
MILTON, FLORIDA

| | |
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| CONTRACT NO. | |
| OWNER NO. | |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 1-1 | REV. 0 |

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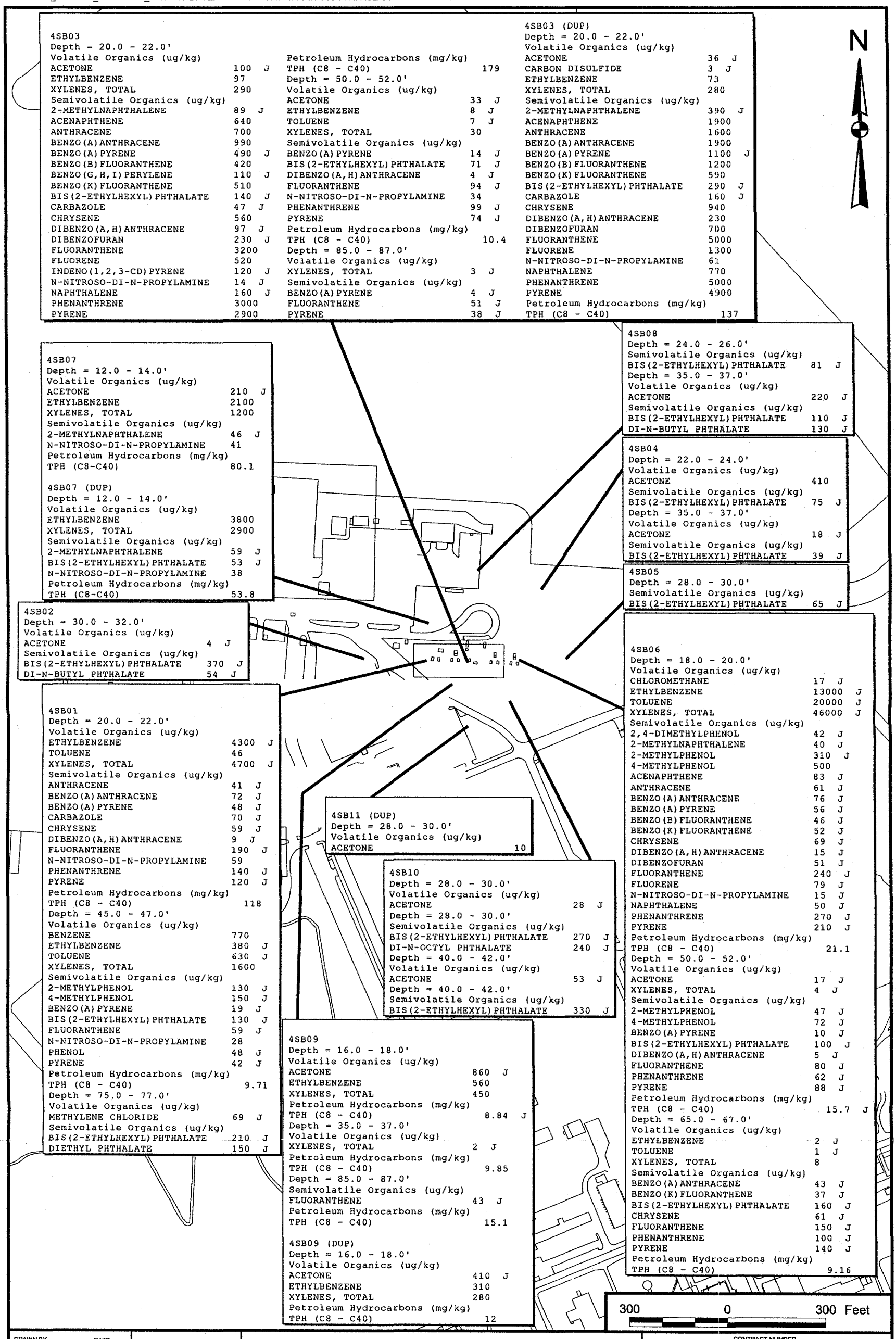
P:\GIS\NAS_WHITING_FIELD\7541_028.APR 21-SEP-98 DNP ORGANICS IN SUBSURFACE SOIL - SITE 4 LAYOUT

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| DRAWN BY: D.PERRY | DATE: 21-SEP-98 |
| CHECKED BY: — | DATE: — |
| COST/SCHEDULE-AREA: — | |
| SCALE: AS NOTED | |

ORGANICS IN SUBSURFACE SOIL AT SITE 4

REMEDIAL INVESTIGATION REPORT FOR SITES 3, 4, 6, 30, 32, AND 33

NAS WHITING FIELD, MILTON, FLORIDA

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|---|---|
| CONTRACT NUMBER: — | |
| APPROVED BY: — | DATE: — |
| APPROVED BY: — | DATE: — |
| DRAWING NO.: FIGURE 5-7 | REV: 0 |