WORK PLAN

CLOSURE OF TEMPORARY ACCUMULATION AREAS 771, 130C, AND MSC P1 UNIT 2 BUILDING 493

FORMER MARINE CORPS AIR STATION EL TORO, CALIFORNIA

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Contract No. N68711-04-C-1010

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
BCT	BRAC Cleanup Team
Bgs	below ground surface
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure Act
BTEX	benzene, toluene, ethylbenzene, and total xylenes
Cal-OSHA	California Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
CSO	Caretaker Site Office
CTO	Contract Task Order
DO	Delivery Order
DOT	U.S. Department of Transportation
DSA	drum storage area
DTSC	Department of Toxic Substances Control
EBS	Environmental Baseline Survey
EPA	U.S. Environmental Protection Agency
EZ	exclusion zone
HI	hazard index
HSWA	hazardous waste storage area
IT	IT Corporation
JEG	Jacobs Engineering Inc.
JP	jet propellant
LUFT	leaking underground fuel tank
MCAS	Marine Corp Air Station
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MTBE	methyl tert-butyl ether
NCP	National Oil and Hazardous Substances Contingency Plan
NFA	no further action
OHM	OHM Remediation Services Corp.

ACRONYMS AND ABBREVIATIONS (Continued)

PCB	polychlorinated biphenyl
PID	photoionization detector
ppmv	parts per million by volume
PR	preliminary review
PRG	preliminary remediation goal
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RMA	RMA Land Construction Inc.
RWQCB	California Regional Water Quality Control Board
SAP	sampling and analysis plan
SHSO	site health and safety officer
SHSP	site health and safety plan
SVOC	semivolatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
SWMU	solid waste management units
SWRCB	State Water Resources Control Board
TAA	Temporary Accumulation Area
TCE	trichloroethene
TCL	target cleanup level
TCLP	toxicity characteristics leaching procedure
TCP	trichloropropane
TEF	toxicity equivalency factors
TPH	total petroleum hydrocarbon
USA	Underground Service Alert
UST	underground storage tank
VOC	volatile organic compound
VSI	visual site inspection
WMP	waste management plan
yd^3	cubic yards
µg/kg	micrograms per kilogram

1.0 INTRODUCTION

RMA Land Construction, Inc. (RMA) has prepared this Work Plan (WP) to be implemented during field activities at the following sites located at the former Marine Corps Air Station (MCAS) El Toro, California (the Station).

- Former Temporary Accumulation Areas (TAAs) 771 and 130C.
- Miscellaneous Sites of Concern (MSC) Pesticide Storage Area 1 (MSC P1) Unit 2, former Building 493.

The work is being performed under Southwest Division Naval Facilities Engineering Command (SWDIV), Contract Number N68711-04-R-1010. Field activities at each location will be coordinated through SWDIV with involvement from the appropriate Caretaker Site Office (CSO) representative.

The field activities at former TAAs 771, 130C and MSC P1 Unit 2; former Building 493 will include excavation of contaminated soil, collection of confirmation soil samples, backfilling of excavated areas with clean soil, and management of excavated soil.

1.1 Site Location and Description

The former Station is located in Orange County, California, approximately 45 miles southeast of the City of Los Angeles, and 1 mile north of the intersection of Interstate 5 (Santa Ana Freeway) and Interstate 405 (San Diego Freeway). The City of Lake Forest is less than 2 miles southeast, and East Irvine is approximately 1 mile to the northwest. The former Station covers approximately 4,700 acres. The location of the former Station is shown on Figure 1-1, Facility Location Map. The locations of former TAA 771, TAA 130C and MSC-P1, Unit 2 site are shown in Figure 1-2, Site Location Map.

1.2 Project Scope and Objective

The objectives at the former TAA 771, 130C and MSC P1 Unit 2 sites are to remove very near surface and subsurface contaminated soils identified by previous investigations, perform confirmation soil sampling to verify removal of contaminated soils and obtain regulatory closure of these sites.

The scope of the work and objectives for each site presented in this work plan is as follows:

- **Former TAA 771 site – Excavation of impacted soil:** This task will involve the excavation of subsurface soil from one area that contains concentrations of metals exceeding human health risk based on residential scenario, confirmation soil sampling, and off-site disposal of excavated soil.

- **Former TAA 130C site – Excavation of impacted soil:** This task will involve the excavation of subsurface soil from two separate areas that contains concentration of metals exceeding human health risk based on the residential scenario, confirmation soil sampling, and off-site disposal of excavated soil.

- **MSC P1, Unit 2, Former Building 493 – Excavation of impacted soil:** This task will involve the excavation of subsurface soil from one area that contains concentrations of pesticide compounds exceeding human health risk based on the residential scenario, confirmation soil sampling, and off-site disposal of excavated soil.

1.3 Work Plan Organization

This work plan outlines procedures for excavation of impacted soil. The work plan is organized to support efficient field execution of these tasks and includes a sampling and analysis plan (SAP) in Appendix A and a Site Health and Safety Plan (SHSP) in Appendix B. Existing background documents and plans from previous contractors are referenced.

1.3.1 Sampling and Analysis Plan

The SAP was prepared to ensure that data collected during the planned field activities are precise, accurate, representative, complete, and comparable to meet the intended use of the data. The SAP incorporates the data quality objectives process and describes quality assurance (QA) objectives and quality control (QC) requirements for this project. The SAP also describes the soil sampling rationale, sample collection procedures, analytical methods, and sampling and analytical QA/QC protocols associated with the tasks described in this work plan. The SAP is presented in Appendix A.

1.3.2 Site Health and Safety Plan

The site health and safety plan (SHSP) presents health and safety procedures required by Title 29, Code of Federal Regulations (CFR), Section 1910.120. The SHSP addresses health and safety issues pertaining to protection of workers against exposure to chemical and physical hazards associated with the tasks described in this work plan, including air monitoring, accident reporting, and emergency procedures. All field activities will be conducted in accordance with the SHSP. The SHSP is presented in Appendix B.

2.0 SITE BACKGROUND

This section provides a brief background and summarizes results from the previous investigations conducted at the former TAA 771, TAA 130C and MSC-P1, Unit 2, former Building 493 sites.

2.1 Former TAA 771

Former TAA 771, a temporary, less than 90-day, Hazardous Waste Storage Area (HWSA) is located in the northwestern quadrant of the Station, west of Bee Canyon Wash. Former TAA 771 is located southeast of former Tank Farm 1 near the intersection of "South 8th" street and West Marine Way as shown in Figure 1-2.

In 1991, Jacobs Engineering Group (JEG) Inc., as part of the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA), performed the initial Preliminary Review (PR) and a Visual Site Inspection (VSI) of the 307 Solid Waste Management Units (SWMUs) within the Station. JEG also conducted a site visit to observe the current conditions of the SWMUs and/or TAAs, and performed limited sampling. JEG identified SWMU 224 (also known as TAA 771) as a temporary HWSA southeast of former Tank Farm 1 during their field RFA visit in April 1991 (JEG 1993).

Per JEG VSI Evaluation form, SWMU 224 (TAA 771) was one of the six Department of Health Services permitted HWSA consisting of a concrete pad with berm and aluminum roof, but no sump. JEG observed that the 180 square foot TAA was not in use and appeared to be inactive for long a time. The concrete pad, however, was covered with about 2-inches of accumulated water. JEG also observed that there were no significant stains or cracks on the concrete pad. Although there was no evidence of a release during the site visit at SWMU 224, JEG recommended that all past permitted HWSAs receive a sampling visit. Therefore, as part of the VSI evaluation process a *"Sampling Visit"* (JEG 1993) was recommended at SWMU 224 (TAA 771).

During the 1992 sampling visit, JEG advanced one angle soil boring (224A1) to a depth of 60 feet below ground surface (bgs) in close proximity of TAA 771 and collected six soil samples and one duplicate. Analytical results for TPH, VOCs, SVOCs, pesticide and PCB compounds were below the contract required detection limit for the Station. As a result of these findings JEG recommended *"No Further Action (NFA)"* for SWMU 224 (TAA 771). Copies of the VSI form, figure and analytical results table from the JEG RFA report are included in Attachment 1, RFA Background Information.

After review of the JEG RFA report, DTSC requested additional information about the TAAs to determine the closure requirements. BNI performed the visual assessment of 73 TAA sites to provide more specific information for a closure strategy for the TAAs. In November 1995, BNI visited SWMU 224, TAA 771 (BNI 1996).

During the BNI VSI in November 1995, the 10-foot by 15-foot TAA 771 was empty, vacant and the concrete pad was clean. Therefore, no soil sampling was performed by BNI. Copies of the TAA 771 VSI evaluation forms from the BNI Final RFA Addendum report are also included in Attachment 1, RFA Background Information.

In October 1997, OHM Remediation Services Corps (OHM) advanced five soil borings to three feet below ground surface next to TAA 771 (TAA771-SB-A, TAA771-SB-B, TAA771-SB-C, TAA771-SB-D and TAA771-SB-E). All soil samples that were collected from 1.5 feet bgs were analyzed for total petroleum hydrocarbons (TPH), pesticides, polychlorinated biphenyls (PCBs), metals, total cyanide, pH, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs). All soil samples collected from three feet bgs were analyzed for VOCs. In December 1999, a *Closure Report, Temporary Accumulation Area 771,* Marine Corps Air Station, El Toro, California was prepared by OHM and submitted to Department of Toxic Substances Control (DTSC) Region 4.

The DTSC reviewed the closure report, and requested additional analysis of 3 feet bgs samples in a letter dated March 22, 2000. In March 2003, Shaw Environmental, Inc. (Shaw) advanced three soil borings in close proximity to the 1997 soil boring locations at TAA 771, and collected soil samples from 3 feet bgs as requested by the DTSC. Based on the presence of arsenic above background levels in one sample at 1.5 feet bgs at TAA771-SB-B, two additional four-foot soil borings (TAA771-SB-B1 and TAA771-SB-B2) were advanced next to TAA771-SB-B in July 2003. Arsenic was not detected above background levels in any of the four soil samples collected from the two four-foot soil borings (Shaw 2003).

Based on the review of analytical data collected by OHM, Shaw and preliminary risk screening analysis, the 13 mg/kg of arsenic (above residential PRGs and Station's background concentrations) in boring TAA 771 SB-B contributed to over 99% of the cancer risk. Also, other detected metal compounds above the residential PRGs in borings TAA 771-SB-B1 and TAA 771-SB-B2 contributed to cancer and non-cancer risk (Shaw 2003). A copy of the OHM and Shaw soil sample analytical data tables are included in Attachment 2, OHM and Shaw Analytical Data Tables. Locations of OHM and Shaw hand auger soil borings are shown in Figure 2-1, Proposed Excavation Area, Former TAA 771.

2.2 *Former TAA 130C*

Former TAA 130C, a temporary, less than 90-day, Hazardous Waste Storage Area (HWSA) is located in the northwestern quadrant of the Station and northwest of Building 130 as shown in Figure 1-2.

In 1991, JEG, as part of the RFA, performed the initial PR and a VSI of the 307 SWMUs within the Station. JEG also conducted a site visit to observe the current conditions of the SWMUs and/or TAA, and performed limited sampling. JEG identified SWMU 42 (also known as TAA 130C) as a temporary Drum Storage Area (DSA) near Building 130 during their field RFA visit in May 1991 (JEG 1993).

Per JEG VSI Evaluation form, SWMU 42 was an active DSA consisting of a plastic lining surrounded by a sandbag berm on a concrete surface, surrounded by a chain link fence. During the VSI, one drum containing dirty rags was stored within the bermed area. No evidence of a release was observed during the VSI, and the DSA appeared to be in good condition. Therefore, as part of the VSI evaluation process JEG recommended *"No Further Action (NFA)"* for SWMU 42 (TAA 130C). Excerpts from the JEG RFA report for TAA 130C are included in Attachment 1, RFA Background Information.

After review of the JEG RFA report, DTSC requested additional information about the TAAs to determine the closure requirements. BNI performed the visual assessment of 73 TAA sites to provide more specific information for a closure strategy for the TAAs. In December 1994, BNI visited SWMU 42 (TAA 130C) near Building 130 (BNI 1996).

During the BNI VSI in 1994, former TAA 130C was observed to be a concrete pad with berm and roof. No stains were observed on the concrete pad during the VSI. Therefore, no soil sampling was performed by BNI. Copies of former TAA 130C VSI evaluation forms from the BNI Final RFA Addendum report are included in Attachment 1, RFA Background Information.

In June 2003, Shaw collected soil samples from four hand auger locations at former TAA 130C site. A total of 6 soil samples were collected from four-hand auger boring locations (TAA130C-SB-A, TAA130C-SB-B, TAA130C-SB-C1 and TAA130C-SB-C2). TAA130C-SB-A was advanced to 5.5 feet bgs, and TAA130C-SB-B was advanced to 3 feet bgs. Refusal was encountered below the 2 feet bgs sample, therefore a second soil boring, TAA130C-SB-C2, was advanced next to TAA130C-SB-C1 in order to collect a sample from 3 feet bgs (Shaw 2003). A copy of the Shaw soil sample analytical data table for the TAA 130C site is included in Attachment 2, OHM and Shaw Analytical Data Tables. Locations of Shaw hand auger soil borings are shown in Figure 2-2, Proposed Excavation Area, Former TAA 130C.

2.3 MSC-P1, Unit 2

Former Building 493 is located in the southwest quadrant of the Station, between Agua Chinon Wash and Bee Canyon Wash. The former Building 493 encompass an area approximately 20 by 20 feet, located southwest of the Marine Way and "L" Street intersection as shown in Figure 1-2. Included within the area are remnants of the concrete foundation of the former building and the asphalt-paved area around the old building footprint.

The Final Environmental Baseline Survey (EBS) Report (Jacobs Engineering Group Inc., 1995) indicated that pesticides were stored at former Building 1687 (MSC P1 Unit 1) and former Building 493 (MSC P1 Unit 2). In 1998, OHM conducted an interview with a Station employee. The interview indicated that former Building 493 was also used for pesticide storage in the early 1980's, and includes the former building area, the paved and unpaved surfaces to the west of the building site, and the drainage swale to the west. This site had not previously been identified as a pesticide storage site. Pesticides and herbicides were stored in the building, which had a concrete floor; however, it was reported that nothing was dumped inside the building (OHM 1998). As a follow up to the interviews, site visits were conducted to the MSC P1 locations identified in the interview. No visible stains or other indications of spills were observed at either location. Based on the existing landmarks, OHM proposed the location of the soil borings and hand auger sample locations (IT Corporation 2002).

Following the interview and site visits, OHM developed a sampling strategy in January 1999 and presented it to the Navy and DTSC. Two former pesticide storage areas were identified that included former Building 1687 (MSC P1 Unit 1) and former Building 493 (MSC P1 Unit 2).

The sampling strategy at former Building 493 was focused on obtaining soil samples adjacent to the former Building foundation to evaluate potential migration and extent of the contaminants.

At the former Building 493 location, the verification sampling effort consisted of three soil borings, BLDG-493-PB01 through BLDG-493-PB03, to approximately 30 feet bgs. Two hand auger soil borings, BLDG-493-HA04 and BLDG-493-HA05, were hand augered to 9 feet bgs in the vicinity of the former Building 493 as shown on Figure 2-3, Proposed Excavation Area, MSC P1 Unit 2. A copy of the OHM soil sample analytical data table for the MSC P1 Unit 2 is included in Attachment 2, OHM and Shaw Analytical Data Tables.

<u>Detected Pesticides at MSC P1 Unit 2</u>

Fourteen pesticide analytes were detected in the soil samples collected from borings HA04, HA05, PB01 and PB03, all of which are adjacent to the former Building 493. No pesticide

analytes were detected in PB02. The maximum concentrations of pesticide analytes detected in each boring are summarized as follows:

- 4,4-DDD was detected in several samples, at 18 (J) mg/kg in boring HA-04 at 1 foot bgs, at 0.44 (J) mg/kg in boring HA-05 at 3 feet bgs, 0.044 mg/kg in boring PB-01 at 5 feet bgs, and 0.26 mg/kg in boring PB-03 at 5 feet bgs.
- 4,4 DDE was detected in several samples, at 3.3 (J) mg/kg in boring HA-04 at 1 foot bgs, 0.053 mg/kg in boring PB-01 at 5 feet bgs, and 0.24 mg/kg in boring PB-03 at 5 feet bgs.
- 4,4-DDT was detected at 27 (J) mg/kg in boring HA-04 at 1 foot bgs, at 2 (J) mg/kg at 3 feet bgs in boring HA-05, 0.298 mg/kg in boring PB-01 at 5 feet bgs, and 1.57 mg/kg in boring PB03 at 5-feet bgs.
- Aldrin was detected at 0.023 (J) mg/kg in boring HA-04 at 1 foot bgs
- Alpha-chlordane was detected at 0.15 (J) mg/kg in boring HA-04 at 1 foot bgs
- Dieldrin was detected at 0.06 (J) mg/kg in boring HA-04 at 1 foot bgs
- Endosulfan I was detected at 0.14 (J) mg/kg in boring HA-04 at 1 foot bgs
- Endrin was detected at 0.014 (J) mg/kg in boring HA-05 at 3 feet bgs
- Endrin aldehyde was detected at 0.033 (J) mg/kg in boring HA-04 at 1 foot bgs
- Dicofol was detected at 0.39 mg/kg in boring HA-04 at 1 foot bgs and 0.0025 (J) mg/kg in boring HA-05 at 1 foot bgs
- Malathion was detected at 10 (J) µg/kg in boring HA-04 at 3 feet bgs
- Gamma chlordane was detected at 0.0045 (J) mg/kg in boring HA-05 at 1 foot bgs and 0.0093 (J) mg/kg in boring HA05 at 9 feet bgs
- Heptachlor was detected at 0.21 (J) mg/kg in boring HA-04, 0.002 (J) mg/kg in soil boring PB01 at 5 feet bgs, and PB03 at a depth of 10 feet bgs at 2 (J) µg/kg
- Methoxychlor was detected at 3 (J) µg/kg in boring PB01 (20242-876) and PB03 (20242-892) at 10 feet bgs.

No other pesticide compounds were detected at or above the stated reporting limit in the borings around former Building 493. The detected pesticides were limited to a 10-foot depth or less, (the majority were in the top 1 to 5 feet) which is consistent with the limited mobility of pesticides in soil. In addition, a majority of the detected compounds were estimated ((J)) values (IT 2002).

IT Corporation prepared and submitted a closure report, MSC P1 Former Pesticide Storage Areas, in January 2002. DTSC reviewed the closure report and requested further action, since cancer risk for the residential scenario was exceeding the screening value of 1 x 10^{-6} (DTSC 2002).

3.0 REGULATORY COMPLIANCE AND DOCUMENTATION

This section describes the clean up levels and data evaluation methodology and procedures for closure of the TAAs and MSC P1 Unit 2 site.

3.1 Target Cleanup Levels

Cleanup goals for soil at former TAA 771, TAA 130C and MSC P1, Unit 2, Former Building 493 is based on:

- EPA Region IX preliminary remediation goals (PRGs) for residential use for organic contaminants (EPA, 2002)
- Background concentrations (BNI, 1996b) or EPA Region IX PRG values, whichever is greater, for residential land use for metal contaminants.

If soil analytical data from all three sites suggest low concentrations of organic compounds and background levels of metals in the vadose zone, screening-level risk assessment/hazard index calculations (for carcinogenic and noncarcinogenic impacts respectively) will be performed as applicable. The screening-level risk assessment will provide documentation that the remaining residual concentrations of organic and metal compounds do not pose a significant threat to human health or the environment.

3.2 Evaluation Methodology and Procedures

The following presents the methodology and procedures used to evaluate soil confirmation results in order to obtain site closure.

3.2.1 TAAs and MSC P1 Unit 2 Site

A screening risk methodology for organics and metals will be used to evaluate site closure. The screening risk approach is based on the COCs for each specific site.

The final confirmation soil sampling results and the historical previous soil boring results outside the final excavation area, for organic and metal analytes will be used to calculate the cumulative carcinogenic and noncarcinogenic risks. The risk assessment screening process to determine the carcinogenic and noncarcinogenic risk is as follows:

- The highest measured concentration (including estimated values [flagged with "J"]) for each organic analyte detected in soil boring samples (in areas not excavated) or final confirmation soil samples (in areas excavated) will be divided by the respective carcinogenic or noncarcinogenic PRG. The results of this calculation are termed the site-

specific "risk quotient" for incremental cancer risk and the "hazard index (HI) quotient" for noncancer risk. The quotients will then be added together to provide a site-specific cancer risk and noncancer HI values.

- The final site-specific risk values are referred to as the net cancer risk and noncancer HI. If the net cancer risk or HI exceeds $1x10^{-6}$ or 1.0, respectively, additional excavation will be undertaken, if practicable. In general, if the net cancer risk and HI totals were less than $1x10^{-6}$ or 1.0, respectively, the site will be recommended for "no further action."

4.0 PRECONSTRUCTION ACTIVITIES

Preconstruction activities include meetings, fulfilling permit requirements, issuing notifications, and inspecting facilities and utilities.

4.1 Permitting and Notifictation

Applicable permits and/or authorizations to proceed will be obtained before work begins at the sites. Before beginning fieldwork, notifications of the following planned work will be provided as specified:

- Excavation and trenching activities to the local California Occupational Safety and Health Administration (Cal-OSHA) division office
- Excavation activities to Underground Service Alert (USA)
- Utility clearance request (Dig Permit) to the CSO
- Work activities, potential exposures, site security measures, air monitoring, controls for minimizing releases, and emergency contacts will be kept on site during all field activities.

Fieldwork will be implemented in accordance with the SHSP included in Appendix B.

4.2 Premobilization Activities

Several activities will be completed before mobilization of personnel and equipment to the site, including convening preconstruction meetings and procuring equipment, subcontractors, and materials necessary to complete the activities described in this work plan.

4.2.1 Meetings

Preconstruction Meeting – A preconstruction meeting will be scheduled before field mobilization. The purpose of the meetings will be to discuss project-specific issues, roles of all project personnel, project schedule, and other issues. The meetings will be attended by representatives of the Navy, CSO and the RMA. A mutual understanding meeting will also be scheduled to discuss the QC procedures for the project.

Construction Quality Control Meeting – Construction QC meetings will be held on a weekly basis throughout the course of the fieldwork described in this work plan. The meetings will be attended by the Navy Remedial Project Manager, the CSO representative, and the RMA site superintendent and field QC engineer. The agenda for the meetings will include project status

review and work accomplished, scheduling issues, identification of action items, and corrective measures.

4.2.2 Procurement

Procurement activities will include subcontractor prequalification and procurement of materials and equipment.

4.3 Site Survey

Site surveys will be performed to locate aboveground and underground utilities and establish survey controls.

4.3.1 Identification of Utilities

RMA will identify underground piping, utilities, or other types of metallic underground structures within and near the planned work areas using a underground pipe locator. The utilities will be marked on the ground with indications (standard colors, letters, and numbers) of the assumed type of utility. The location and type of utilities will also be compared with existing Navy subsurface utility maps. This information will be provided to the CSO in the form of a utility clearance request (Dig Permit) for approval prior to excavating. Before excavation activities begin, the public underground utility location service USA will be contacted to document utilities within their responsibility and a final visual inspection for subsurface utilities will be made, including a review of drawings and site markings.

4.3.2 Land Surveying

A California-licensed surveyor will establish construction and excavation setback control points. The surveyor will also determine the horizontal and vertical position of sample locations. Points will be surveyed using the State Plane Coordinate System (Lambert Zone G). The northing and easting coordinates of each point will be measured to the nearest 0.01 foot with reference to the North American Datum of 1983. In addition, the northing and easting coordinates will be converted to latitude and longitude coordinates. The elevation of each point will be measured to the nearest 0.01 foot with reference to the North American Vertical Datum of 1988.

4.4 Mobilization

Project site mobilization will involve establishing the staging areas for equipment and material storage. Earthmoving equipment, including backhoes and other necessary equipments, will be delivered to the site and inspected prior to start of the field work.

5.0 GENERAL CONSTRUCTION ACTIVITIES

This section describes the general construction activities associated with the excavation of contaminated soil at the Station. These activities include the establishment of site controls, site preparation, and equipment and personnel decontamination.

5.1 Site Controls

Site controls will be established to regulate or guide operations and to protect the facility, surrounding environment, and natural resources.

5.1.1 Quality Control

A QC field engineer will be assigned to this project to observe, inspect, and document site activities. The QC field engineer will ensure that the work is performed in general accordance with this work plan, applicable engineering standards, and QC procedures.

5.1.2 Site Security

At present, the Station is nonoperational and access to the Station is regulated by City of Irvine Police. Access to the Station outside of normal operating hours will be coordinated with the Irvine Police and CSO representatives. Facility security will include the following control:

- ***Facility Access*** – Personnel requiring access to the Station are required to satisfy base access requirements as stipulated by the facility, including proof of identity (company identification and valid driver's license).

Daily project operations will be between the hours of 0600 and 1800; however, the hours for excavation, loading, and other operations will be between 0700 and 1730 unless otherwise authorized by the Navy and the CSO representative. When construction operations are not actively in progress, all traveled lanes of the roadway will be maintained for use or secured with traffic controls. The CSO representative will review traffic controls. During site remediation activities, work areas will be secured to minimize public exposure to contaminants and unauthorized entry. Site controls will include the following:

- ***Fencing*** – Temporary fence panels with appropriate signs will be assembled around excavation and selected remediation areas unless directed otherwise by the site superintendent.

- ***Site Access*** – An exclusion zone (EZ) will be established around the perimeter of the work areas and excavations. Fences and/or flagging (caution tape) may be used to delineate the EZ. Only project personnel, approved subcontractors, and authorized

visitors who provide evidence of having completed 40 hours of Hazardous Waste and Emergency Response training and annual updates in accordance with 29 CFR 1910.120 and who comply with SHSP requirements will be allowed to enter the EZ. Personnel must follow applicable health and safety procedures and protocols and will be required to wear appropriate personal protective equipment described in the SHSP.

Access to the project areas will be limited to minimize public exposure to contaminants. Signs to direct vehicle and pedestrian traffic will be posted at entrance and exit points as needed.

5.1.3 Dust and Emission Control

Engineered controls will be implemented during site construction to minimize the dispersion and creation of dust and VOC emissions. Engineered controls could include, but will not necessarily be limited to, the following activities:

- Application of potable water
- Application of dust suppressants
- Installation of temporary wind screens/barriers
- Use of plastic sheeting covers
- Control of equipment and vehicle speed
- Application of gravel to unpaved haul routes
- Covering of truck beds with tarpaulins or equivalent.

5.2 Site Preparation

Steps will be taken to protect vegetation, landscape, and other facility features near the planned fieldwork. Materials temporarily removed (e.g., active utilities, property-line or security fencing, and other facility elements) will be restored "in-kind" unless directed otherwise by the CSO personnel. No property or materials will be disposed of by RMA without the concurrence of the CSO personnel.

5.3 Equipment and Personnel Decontamination

Equipment and personnel exiting an EZ (Section 5.1.2) will follow the decontamination procedures presented in SHSP. The level of decontamination of equipment will be determined by the SHSO. The need for and degree of decontamination will be based on the characteristics of the material within the EZ, associated health risks, and the potential for transporting COCs outside the EZ.

In general, equipment decontamination areas will consist of an impermeable surface (e.g., plastic sheeting and sealer coat) to catch material removed from equipment for collection and disposal.

If a greater decontamination effort is required, the equipment decontamination station could include a bermed area with an impermeable surface and a low point for the collection of liquids. If necessary, a protective layer (e.g., geosynthetic material, sand layer, or soil layer) will be installed to protect the liner from puncture. A decontamination water source and rinsate water collection tank will be located adjacent to the area, as needed. In addition, a decontamination area will be developed for equipment to be removed from the site. Decontamination areas will be located near the exit points for off-site traffic

Decontamination water will be stored, sampled, managed, and disposed of in accordance with the procedures outlined in the SAP (Appendix A).

6.0 EXCAVATION OF IMPACTED SOIL

Previous soil sampling data indicate that excavation and off-site disposal of residual metal contaminated soil at former TAA 771, former TAA 130C and pesticide contaminated soil at MSC P1 Unit 2 is required to reduce human health risk based on the residential scenario. Eliminating the soil will remove the exposure pathways for dermal contact, ingestion, and inhalation of contaminated soil. The limits of the excavations are approximate and are based on previous soil sampling analytical results.

6.1 Summary of Excavation Activities at Former TAA 771

Per review of all the background information, RMA will remove subsurface contaminated soils at former TAA 771 site to the levels that will not pose an excessive human health risk based on residential scenario. Subsurface soil will be removed in the vicinity of borings TAA 771 SB-B, SB-B1 and SB-B2 up to 5 feet bgs as shown in Figure 2-1. Excavation of subsurface soil at former TAA 771 will also remove exposure pathways for dermal contact, ingestion, and inhalation of metal contaminated soil. Confirmation soil sampling will be conducted subsequent to soil removal.

The following table presents a summary of the proposed excavation activities at Former TAA 771.

Description	Contaminant of Concern	Dimensions – Length x Width (ft)	Depth Range (ft)	Volume (yd^3)	Volume (tons)
Former TAA 771, near boring SB-B1 & SB-B2	Metals (Arsenic)	6 x 3	5	~4	5.3
Former TAA 771, near boring SB-B	Metals (Arsenic)	3 x 3	2	~0.7	~1

ft – feet
yd^3 – cubic yards
~ – approximate

6.2 *Summary of Excavation Activities at Former TAA 130C*

Review of the Shaw analytical data suggest that arsenic was detected above Station background levels, in three of the samples collected from TAA 130C-SB-B (8.7 mg/kg at 3 feet bgs), TAA 130C-SB-C1 (26.1 mg/kg at 2 feet bgs) and TAA 130C-SB-C2 (35.8 mg/kg at 3 feet bgs). Other analytes detected above Station Background levels included: aluminum, chromium, cobalt, lead, and zinc.

Per review of all the background information, RMA will remove subsurface contaminated soils at former TAA 130C site to the levels that will not pose an excessive human health risk based on the residential scenario. Subsurface soil will be removed in the vicinity of borings TAA 130C SB-B, SB-C1 and SB-C2 up to 5 feet bgs as shown in Figure 2-2. Excavation of subsurface soils from two separate areas at former TAA 130C will also remove exposure pathways for dermal contact, ingestion, and inhalation of metal contaminated soil. Confirmation soil sampling will be conducted subsequent to soil removal.

The following table presents a summary of the proposed excavation activities at former TAA 130C.

Description	Contaminant of Concern	Dimensions – Length x Width (ft)	Depth Range (ft)	Volume (yd^3)	Volume (tons)
Former TAA 130C, near boring SB-B	Metals (Arsenic)	5 x 5	5	~5	6.3
Former TAA 130C, near boring SB-C1 & SB-C2	Metals (Arsenic)	5 x 5	5	~5	6.3

ft – feet
yd^3 – cubic yards
~ – approximate

6.3 *Summary of Excavation Activities at MSC-P1, Unit 2*

Review of the OHM analytical data suggests that maximum concentrations of pesticides were detected in hand auger boring HA-04 at 1 and 3 feet bgs. Therefore, RMA will remove subsurface contaminated soils at MSC P1 Unit 2, former Building 493 site to the levels that will

not pose an excessive human health risk based on residential scenario. Subsurface soil will be removed in the vicinity of boring HA-04 up to 5 feet bgs as shown in Figure 2-3. Excavation of subsurface soil will also remove exposure pathways for dermal contact, ingestion, and inhalation of pesticide contaminated soil. Confirmation soil sampling will be conducted subsequent to soil removal.

The following table presents a summary of the proposed excavation activities at MSC P1, Unit 2, former Building 493.

Description	Contaminant of Concern	Dimensions – Length x Width (ft)	Depth Range (ft)	Volume (yd^3)	Volume (tons)
Former Building 493, near boring HA-04	Pesticides	5 x 5	5	~5	6.3

ft – feet
yd^3 – cubic yards
~ – approximate

The proposed excavation limits and confirmation soil sampling locations are shown in Figure 2-3.

6.4 *Excavation*

Excavation of impacted soil will be performed in a stepwise fashion using heavy construction equipment. In general, excavation of impacted soil will be performed in accordance with the following sequence:

1. Implement the necessary controls to help protect surrounding improvements and minimize impacts to the environment and surrounding communities (Section 5.1).
2. Mark perimeter of area to be excavated with paint or chalk lines.
3. Remove existing above and below grade improvements and saw-cut and remove the pavement surface, if necessary.
4. Excavate the impacted soil using a rubber-tired backhoe for limited access locations. Continue excavation to the depth determined based on previous soil characterization and removal activities (Section 2.0).
5. Place the excavated soil in suitable containers or temporary stockpiles.
6. Establish a sample grid and collect sidewall and excavation bottom floor samples.

7. Continue excavating in the next area pending receipt of analytical results for the previous area.

8. If results for the confirmation samples are below cleanup criteria presented in the site-specific SAP (Appendix A), the excavated section can be backfilled and site restoration can begin (Step 9). Otherwise, expand the excavation and return to Step 6.

9. Restore the site to original conditions, as practicable (Section 6.7).

6.5 Stockpiled Soil Management and Disposal

Excavated soil from all three sites will be stockpiled and sampled, managed, and disposed of in accordance with the procedures outlined in the SAP (Appendix A).

The stockpiles will be constructed and managed to minimize the discharge of any surface water that could collect in them and to minimize air quality impacts and reduce nuisance odors in accordance with SCAQMD Rule 1166. The contaminated soil carriers, containers, and stockpiles will be sampled, managed, and disposed of in accordance with the procedures outlined in the SAP (Appendix A).

At the end of each workday, each stockpile will be inspected and secured with temporary fencing or barricades with appropriate signs. Corrective measures will be instituted to ensure the integrity of the stockpile, if needed. For off-site soil disposal, the stockpiles will remain at the Station until the Navy has determined the method and site for disposal, the licensed disposal facility has formally accepted the materials, and waste manifests or bills of lading are signed.

6.6 Confirmation Sampling

Excavation sidewall and bottom floor confirmation sampling will be conducted prior to backfilling the excavations to verify that contaminated soil has been removed. All confirmation soil samples will be analyzed for each site-specific contaminants of concern as outlined in the SAP (Appendix A). Locations of confirmation soil samples for each site are shown in Figure 2-1 through Figure 2-3. Soil confirmation sampling procedures, analytical methods, and field documentation procedures are also outlined in the SAP (Appendix A). Confirmation sample points and the limits of the excavations for all three sites will be land surveyed prior to backfill.

6.7 Site Restoration

The remedial excavations will be backfilled with clean fill. The backfill will be placed in loose, 1-foot lifts. Non-self-compacting material will be compacted by mechanical equipment to a

minimum compaction of 90 percent, as determined by American Society for Testing and Materials (ASTM) Method D 1557.

7.0 REPORTING

At the conclusion of field activities, RMA will prepare separate closure reports for all three sites; former TAAs 771, 130C and MSC-P1, Unit 2. These reports will document field activities at each site, including soil characterization, volumes of soil excavated and disposed of, final confirmation sampling results, previous soil sampling data, screening level risk assessment calculations, land survey data and conclusions and recommendations in support of site closure.

8.0 REFERENCES

Bechtel, see Bechtel National, Inc.

Bechtel National, Inc., 1996, *Final Addendum to the RCRA Facility Assessment, San Diego, California, May*

Department of Toxic Substance Control (DTSC) *Letter Comments on Closure Report, Miscellaneous Sites of Concern (MSC) P1, Former Pesticide Storage Areas, Former MCAS El Toro, California* dated July 18, 2002.

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IT Corporation, *Closure Report, MSC P1, Former Pesticide Storage Areas, Building 1687 and 493,* Marine Corps Air Station El Toro, California, January 2002.

Jacobs Engineering Group Inc., 1993, *Final Resource Conservation and Recovery Act (RCRA) Facility Assessment Report, Marine Corps Air Station El Toro, California*, 16 July.

Naval Facilities Engineering Service Center, 1999, *Navy Installation Restoration Chemical Data Quality Manual*, September.

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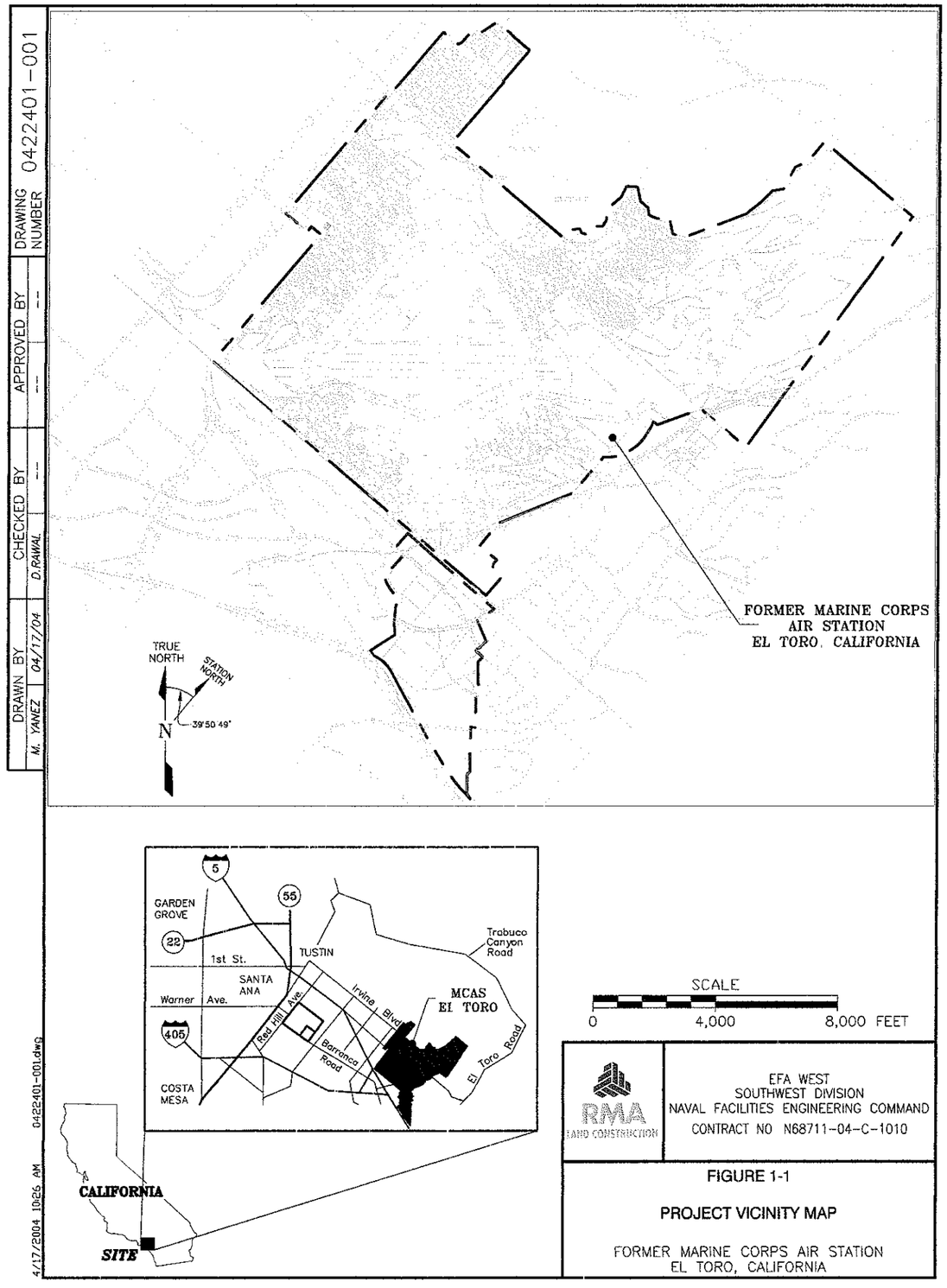
Naval Facilities Engineering Service Center, 1999. *Navy Installation Restoration Chemical Data Quality Manual*

Shaw Environmental Inc., *Status Summary Report, Former TAA 130C site and Former TAA 771 Site*, Former Marine Corps Air Station, El Toro, California. October 2003.

U.S. Environmental Protection Agency, 2002, *Region IX Preliminary Remediation Goals,* http://www.epa.gov/region09/waste/sfund/prg/index.htm, prepared by Stanford J. Smucker, Ph.D., Regional Toxicologist, EPA Region IX, San Francisco, CA, October 01.

FIGURES



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 04/17/04	D.RAWAL --	-- --	0422401-001

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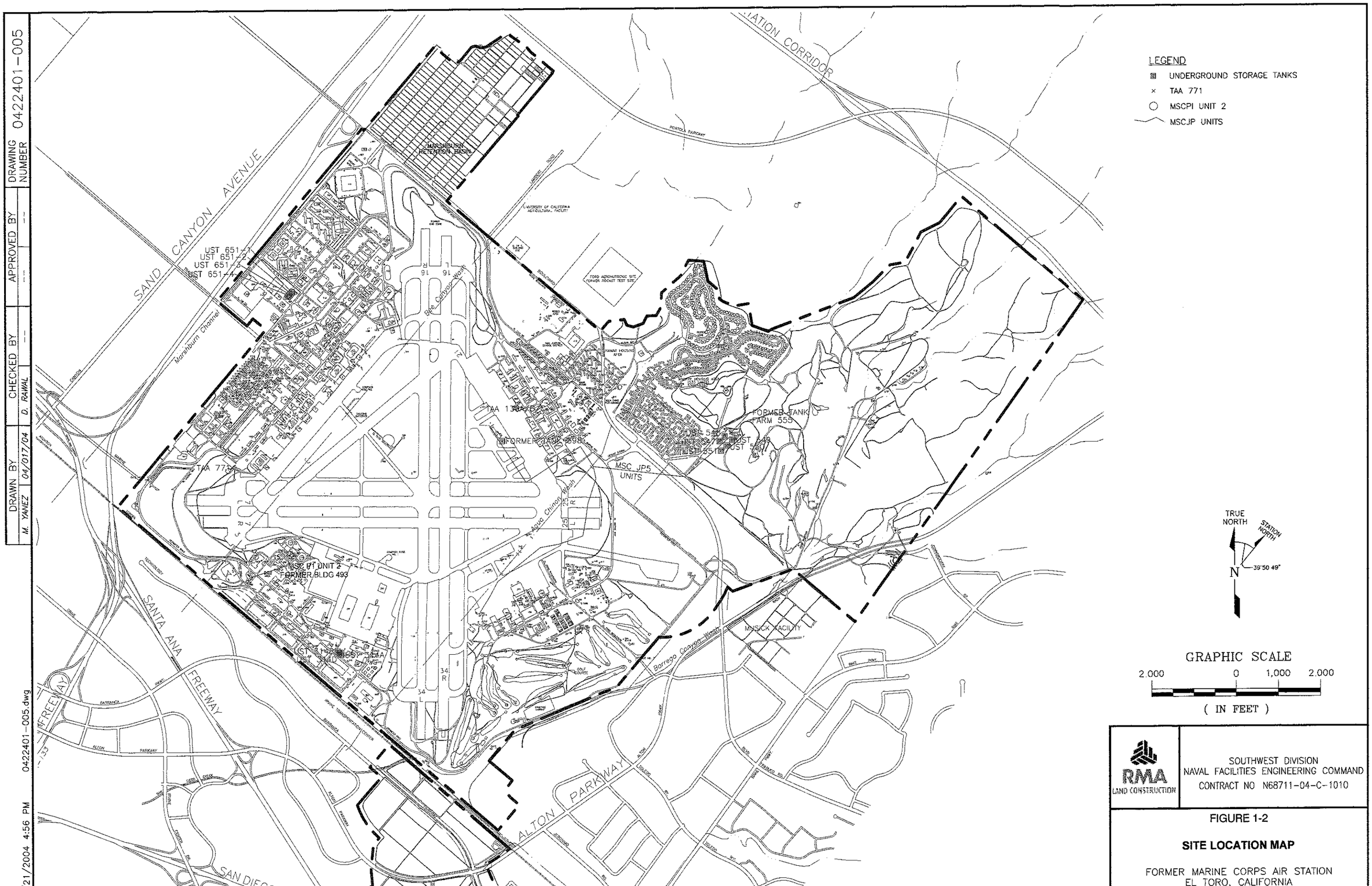
RMA LAND CONSTRUCTION

EFA WEST
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO N68711-04-C-1010

FIGURE 1-1

PROJECT VICINITY MAP

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA



RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO N68711-04-C-1010

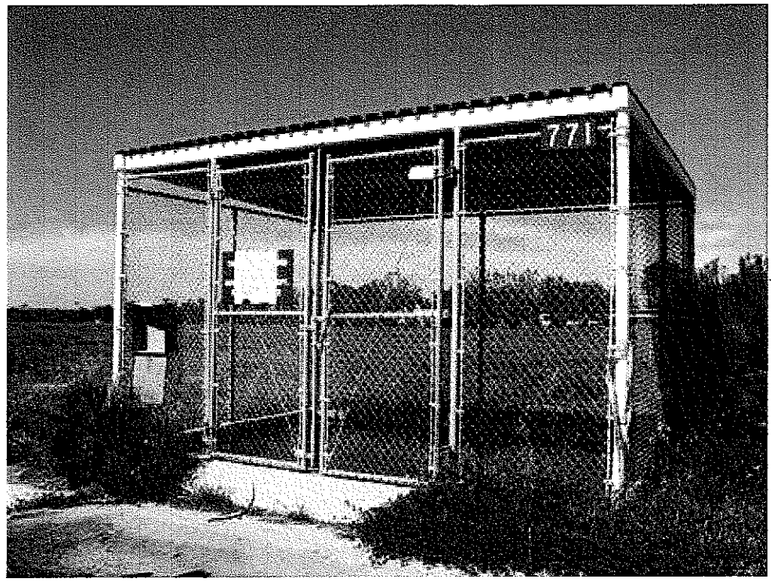
FIGURE 1-2

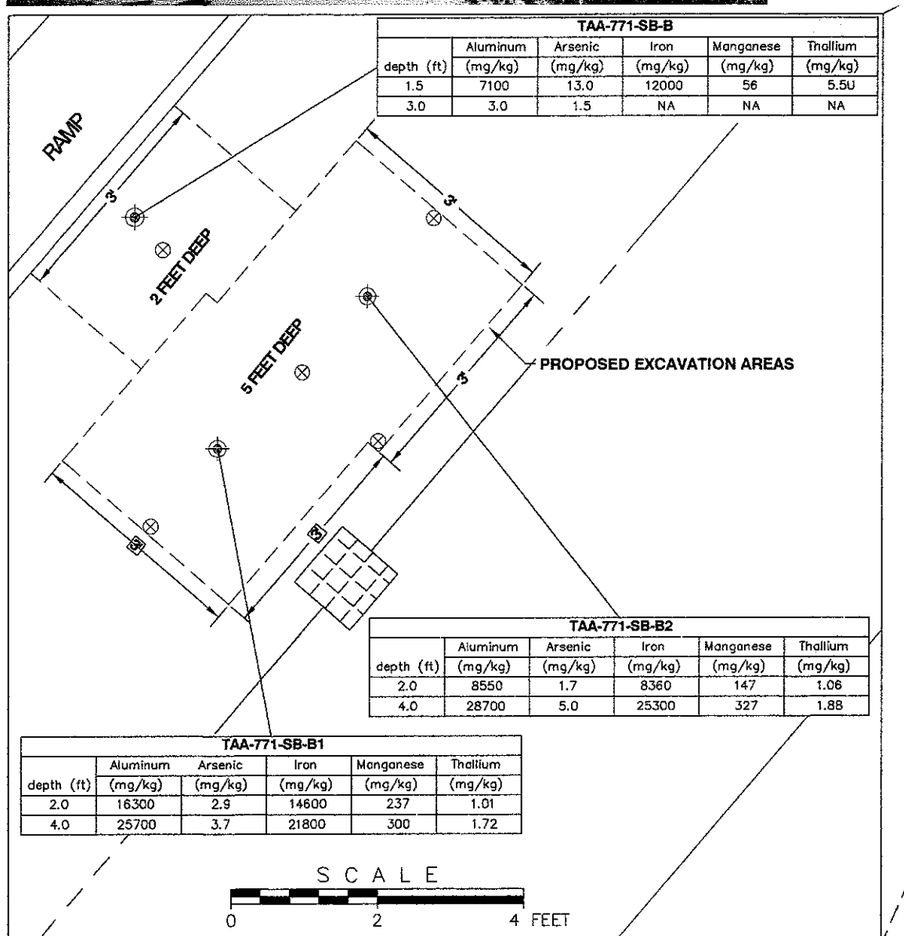
SITE LOCATION MAP

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 04/017/04	D. RAWAL	---	0422401-005

4/21/2004 4:56 PM 0422401-005.dwg





TAA-771-SB-B

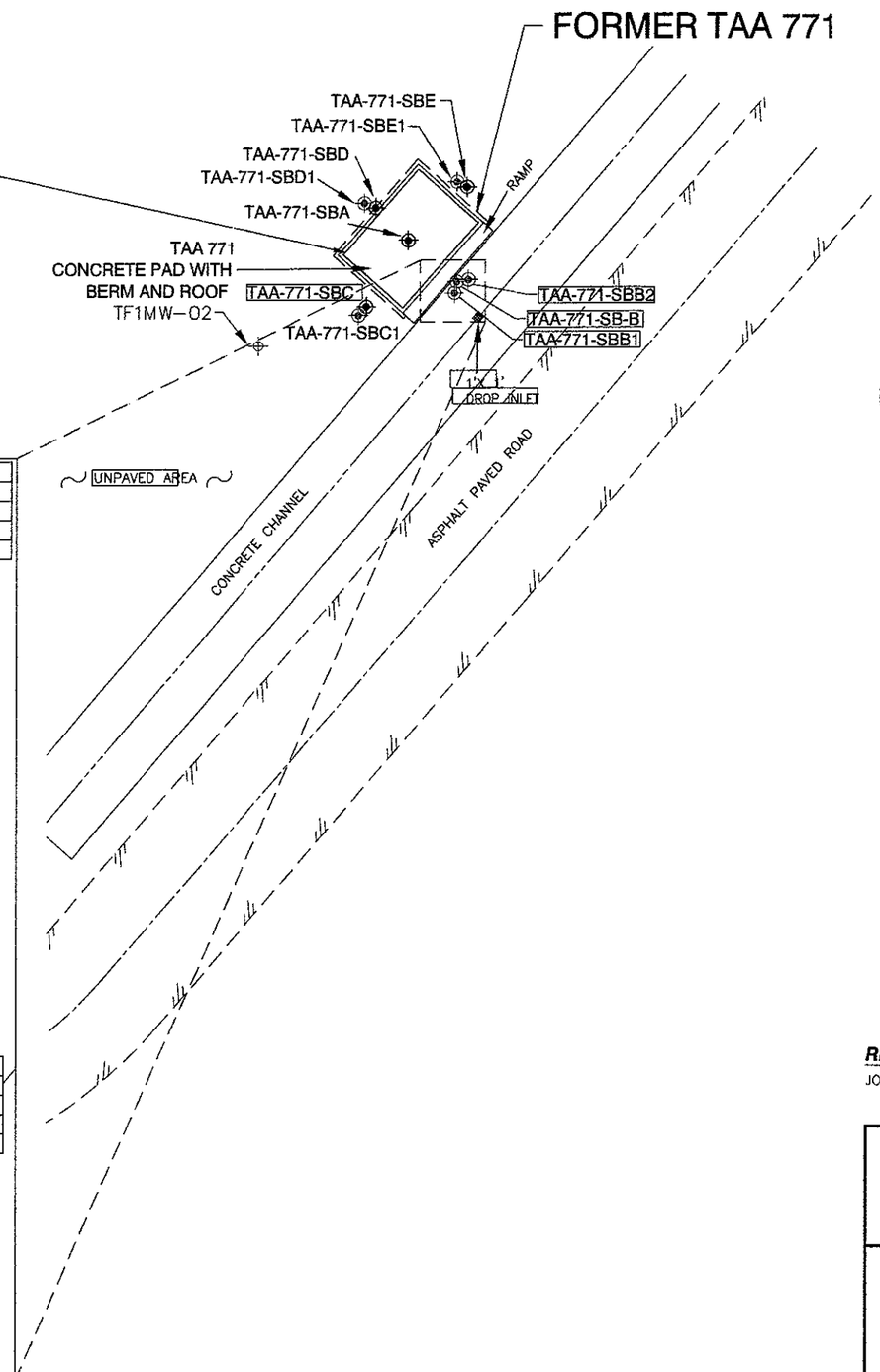
depth (ft)	Aluminum (mg/kg)	Arsenic (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Thallium (mg/kg)
1.5	7100	13.0	12000	56	5.5U
3.0	3.0	1.5	NA	NA	NA

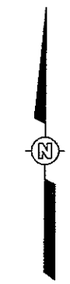
TAA-771-SB-B2

depth (ft)	Aluminum (mg/kg)	Arsenic (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Thallium (mg/kg)
2.0	8550	1.7	8360	147	1.06
4.0	28700	5.0	25300	327	1.88

TAA-771-SB-B1

depth (ft)	Aluminum (mg/kg)	Arsenic (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Thallium (mg/kg)
2.0	16300	2.9	14600	237	1.01
4.0	25700	3.7	21800	300	1.72





EXPLANATION:

- GROUNDWATER MONITORING WELL
- SHAW 1997 CONFIRMATION SAMPLE LOCATION
- SHAW 2003 CONFIRMATION SAMPLE LOCATION
- PROPOSED EXCAVATION CONFIRMATION SOIL SAMPLE LOCATION
- CENTERLINE OF STREET
- EDGE OF PAVEMENT
- CENTER OF CONCRETE CHANNEL
- PROPOSED EXCAVATION
- DROP INLET

SCALE
0 20 40 FEET

REFERENCE:

JOB NO. 97102-07C DWG BY CALVADA SURVEYING INC

RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-04-C-1010

FIGURE 2-1

PROPOSED EXCAVATION AREA
FORMER TAA-771

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 4/17/04	D. RAWAL --	-- --	0422401-007

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SAMPLE COORDINATE LISTING

NORTHING	EASTING	FS	DESCRIPTION
2193435.31	6114609.31	405.39	TAA130-SG-1
2193428.35	6114609.53	405.25	TAA130-SG-2
2193419.79	6114580.42	404.29	TAA130-SG-3
2193479.14	6114597.45	405.59	TAA130-SB-A
2193470.06	6114608.65	405.56	TAA130-SB-B
2193457.09	6114608.53	405.59	TAA130-SB-C1
2193457.42	6114609.86	405.59	TAA130-SB-C2

FORMER TAA 130C

TAA130-SB-A
SUMP
TAA130-SB-B
TAA130-SB-C2
STEEL SHACK
RAMP
TAA130-SB-C1
BUILDING 921
TAA130-SG-1
TAA130-SG-2
TAA130-SG-3
BUILDING 130
FORMER TAA 130A AND TAA 130B
CONCRETE

LEGEND

- PREVIOUS SHAW SHALLOW CONFIRMATION SAMPLE POINTS
- PROPOSED EXCAVATION CONFIRMATION SOIL SAMPLE LOCATION
- CHAIN LINK FENCE
- PROPOSED EXCAVATION AREA

5FT
5FT
0 2.5 5
SCALE IN FEET
5FT DEEP
PROPOSED EXCAVATION

TAA 130-SB-B	
DEPTH(FT)	ARSENIC(mg/kg)
1.5	3.6
3.0	8.7

TAA 130-SB-C1	
DEPTH(FT)	ARSENIC(mg/kg)
2.0	26.1

TAA 130-SB-C2	
DEPTH(FT)	ARSENIC(mg/kg)
3.0	35.8

5FT
5FT
5FT DEEP

N

GRAPHIC SCALE
0 10 20 40
(IN FEET)

RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-04-C-1010

FIGURE 2-2
PROPOSED EXCAVATION AREA
FORMER TAA-130C
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWING NUMBER 0422401-006
APPROVED BY
CHECKED BY D. RAWAL
DRAWN BY M. YANEZ 04/17/04
0422401-006.dwg
4/23/2004 8:33 AM

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 04/17/04	D. RAWAL --	-- --	0422401-008

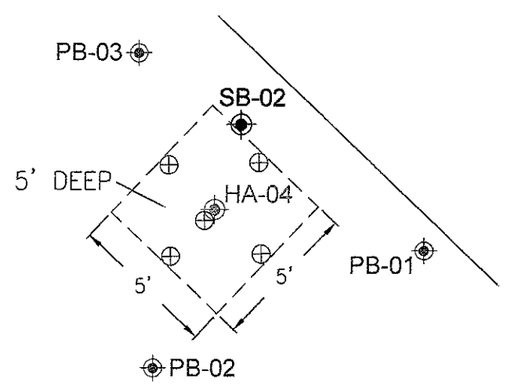
4/23/2004 8:30 AM 0422401-008.dwg

Sample Location

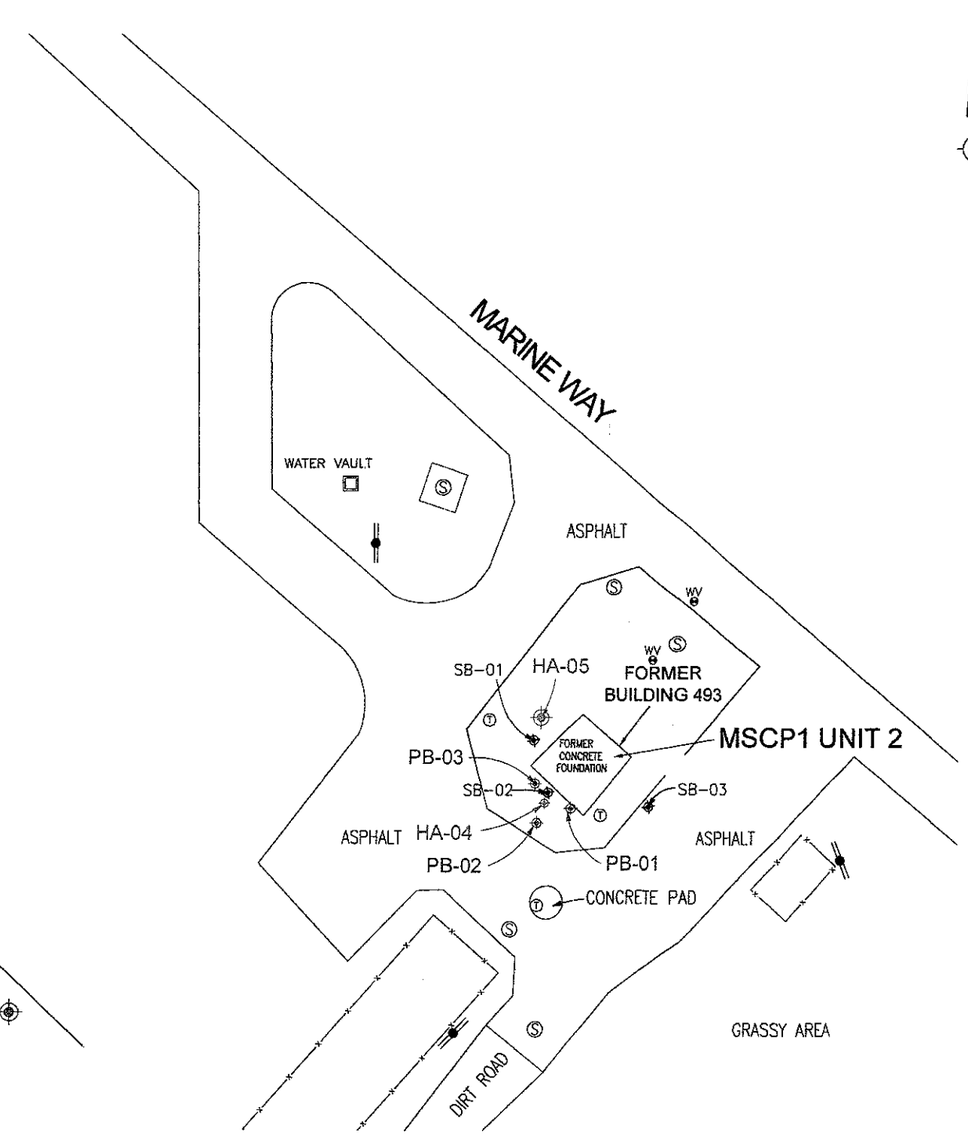
Boring Number	Location: Northing (NAD 83)	Easting (NAD 83)	Elevation (ft msl)
HA03	2189715 16	6107394 03	254.07
HA04	2189554 11	6107533 06	255 32
HA05	2189577 37	6107532.04	255 42
PB01	2189552 72	6107540 23	255 28
PB02	2189548 73	6107530 97	255 13
PB03	2189559 42	6107530 44	255 36

EXPLANATION:

- PREVIOUS OHM PESTICIDE SAMPLE LOCATION
- OHM HAND AUGER SAMPLE LOCATION
- OHM SAMPLE LOCATION (PREVIOUS)
- SEWER MANHOLE
- TELEPHONE MANHOLE
- POWER POLE
- CHAIN LINK FENCE
- WV WATER VALVE
- EDGE OF PAVEMENT
- PROPOSED EXCAVATION CONFIRMATION SOIL SAMPLE LOCATION
- PROPOSED EXCAVATION AREA



PROPOSED EXCAVATION
SCALE: 1"=5'



SCALE
0 40 80 FEET

RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-04-C-1010

FIGURE 2-3
PROPOSED EXCAVATION AREA
MSC P1 UNIT 2 FORMER PESTICIDE STORAGE AREA FORMER BUILDING 493
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

ATTACHMENT 1

RFA BACKGROUND INFORMATION

MARINE CORPS AIR STATION EL TORO
EL TORO, CALIFORNIA
INSTALLATION RESTORATION PROGRAM
FINAL RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY ASSESSMENT REPORT

PREPARED BY:
Southwest Division, Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132-5190

THROUGH:
CONTRACT #N68711-89-D-9296
CTO #193
DOCUMENT CONTROL NO:
CLE-C01-01F193-S2-0001

WITH:
Jacobs Engineering Group, Inc
3655 Nobel Drive, Suite 200
San Diego, California 92122

In association with:
International Technology Corporation
CH2M HILL

M. W. Arends 7/16/93
Mike Arends, P.E. — Date
CLEAN Project Manager
CH2M HILL, Inc.

Raoul Portillo 15 July 1993
Raoul Portillo — Date
CLEAN Technical Reviewer
Jacobs Engineering Group Inc.

1002073B.SCO\93\MA

Evaluation Form
SWMU/Area of Concern
Number 224

Unit Characteristics

This Hazardous Waste Storage Area (HWSA) is one of the six DHS-permitted HWSAs at MCAS El Toro. These six HWSAs (SWMU/AOC Numbers 222 through 227) are not planned for future use. Historically, these six HWSAs have had drums stored outside of the storage area.

The HWSA consists of a concrete storage area surrounded by a 6-in. concrete berm. A chain-link fence and aluminum roof enclose the storage area. At the time of the visit, the inside of the bermed area was covered with about 2 inches of ponding water.

The HWSA was not in use and appeared to have been inactive for a long time. No significant stains or cracks were observed.

Waste Characteristics

Unknown

Possible Migration Pathways

Soil

Evidence of Release

None observed

Exposure Potential

Authorized on-Station personnel

Recommendations

Although there was no evidence of a release during the site visit and hazardous waste was not currently stored in the area, the past and present HWSAs at MCAS El Toro are recommended for a sampling visit.

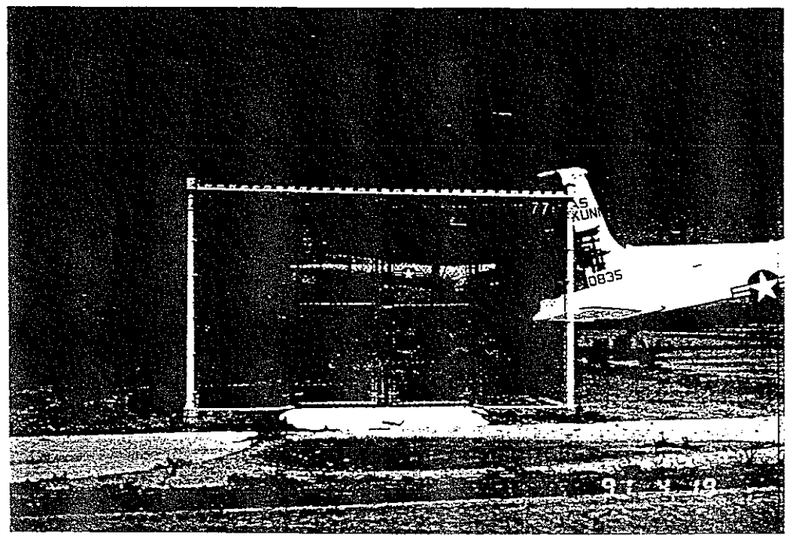
Evaluation Form
SWMU/Area of Concern
Number 224

Name: Hazardous Waste Storage Area 771

Location: Adjacent to the Historical Aircraft display

Size: 180 sq ft

Date of Site Visit: 19 April 91



Period of Operation

Currently inactive

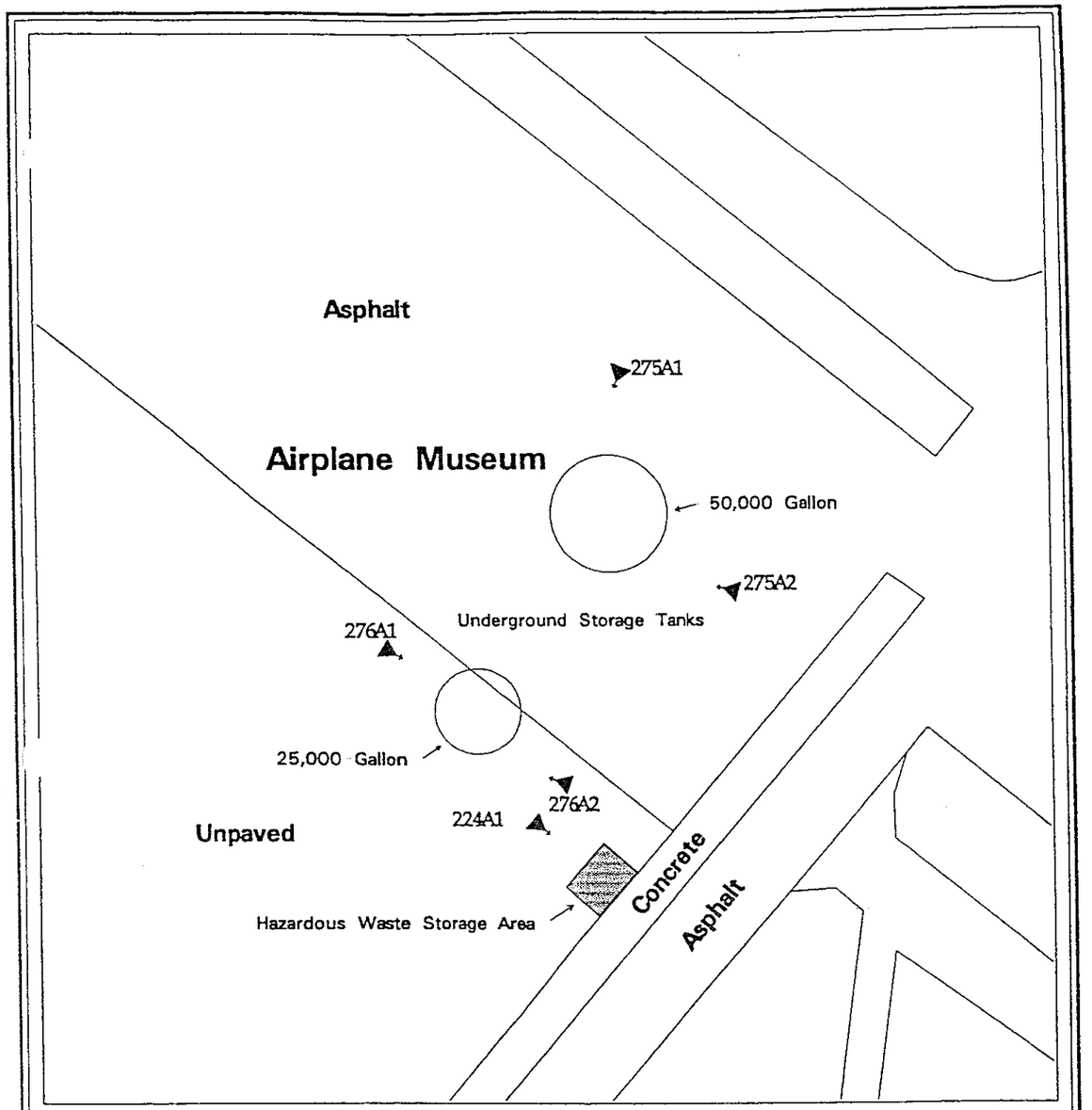


Figure 66 Sample Location Map

Boring Location and Number:

- 123H4 5' Deep Boring
- 123B4 25' Deep Boring
- 123A4 60' Long, Angle Boring

Features:

- Building
- Concrete
- Fence
- Railroad

Scale

0 20 40 80 Feet

SWMU/AOC Number and Type:

224 - Hazardous Waste Storage Area
275 - Underground Storage Tank
276 - Underground Storage Tank

MCAS El Toro
RCRA Facility Assessment

MCAS EL TORO RCRA FACILITY ASSESSMENT – SAMPLING VISIT RESULTS

SWMU/AOC NUMBER	SWMU/AOC TYPE (FIGURE)	BORING NUMBER	SAMPLE DEPTH (FEET)	ANALYTICAL TEST RESULTS							RECOMMENDATIONS	
				TPH (mg/kg)	TFH (mg/kg)		VOCs (ug/kg)	SVOCs (ug/kg)	PESTICIDES/PCBs (ug/kg)	METALS (mg/kg)	Action	Rationale
					Gasoline	Diesel						
224	Hazardous Waste Storage Area (66)	A1	10	ND	ND	ND	Methylene Chloride-5 BJ * Toluene-1 J	Di-n-butylphthalate-29 BJ *	ND	NAB	NFA	TPH/TFH < 100 ppm VOCs < CRDL SVOCs < CRDL Pest/PCB < CRDL Metals < BGT CRDL - Contract Required Detection Limit BGT - Background Threshold Value
			20	ND	ND	ND	Methylene Chloride-6 BJ * Toluene-3 J	Diethylphthalate-39 BJ * Di-n-butylphthalate-46 BJ *	ND	NAB		
			30	ND	ND	ND	Methylene Chloride-4 BJ * Toluene-1 J	Diethylphthalate-39 BJ * Di-n-butylphthalate-35 BJ *	ND	NAB		
			30 (Duplicate)	ND	ND	ND	Methylene Chloride-11 BJ * Toluene-2 J	Di-n-butylphthalate-31 BJ * Bis(2-Ethylhexyl)phthalate-58 J	ND	NAB		
			40	ND	ND	ND	Methylene Chloride-9 BJ * Toluene-2 J	Di-n-butylphthalate-40 BJ *	ND	NAB		
			50	ND	ND	ND	Methylene Chloride-9 BJ * Toluene-2 J	Di-n-butylphthalate-25 BJ *	ND	NAB		
			60	ND	ND	ND	Methylene Chloride-14 B * Toluene-4 J	Diethylphthalate-46 BJ * Di-n-butylphthalate-51 BJ *	ND	NAB		

CH2M HILL

PROJECT NUMBER	BORING NUMBER
LA070022 SC 10	224A-1 SHEET OF

SOIL BORING LOG

PROJECT NAVY CLEAN RCRA FACILITY ASSESSMENT LOCATION MCAS-EL TORO

ELEVATION _____ DRILLING CONTRACTOR BEYLIK DRILLING, INC., LA HABRA, CALIFORNIA

DRILLING METHOD AND EQUIPMENT HSA, 4-1/4 ID, 8 OD, FAILING F-10

WATER LEVELS NOT ENCOUNTERED START 10/28/92 FINISH 10/28/92 LOGGER B. HARDESTY

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY SOIL STRUCTURE MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
						Start drilling at 11:25
5.0						
10.0	10.0					
	12.0	1-MC	1.4	6-11-12-14	SANDY LEAN CLAY (CL) grayish brown moist stiff to very stiff fine to coarse sand	HNu=0 ppm OVA=0 ppm
15.0						
20.0	20.0					
	22.0	2-MC	0.8	6-9-11-17	LEAN CLAY (CL) grayish brown moist, very stiff, trace to little fine to medium sand	HNu=0 ppm OVA=0 ppm
	24.0	2A-MC	1.0	11-12-17-17	Similar to 2-MC	HNu=0 ppm OVA=0 ppm
25.0						
30.0	30.0					
	32.0	3-MC	1.9	14-17-18-20	SANDY LEAN CLAY (CL), grayish brown moist very stiff fine to coarse sand	HNu=0 ppm OVA=0 ppm
	34.0	3A-MC	1.5	12-18-20-20	32-33 LEAN CLAY WITH SAND (CL) grayish brown moist very stiff fine to medium sand 33-34 LEAN CLAY (CL), grayish brown moist very stiff fine to medium sand	HNu=0 ppm OVA=0 ppm
35.0						

CH2M HILL

PROJECT NUMBER	BORING NUMBER
LA070022 S0 10	224A-1 SHEET 2 OF 2

SOIL BORING LOG

PROJECT NAVY CLEAN RCRA FACILITY ASSESSMENT LOCATION MCAS-EL TORO

ELEVATION _____ DRILLING CONTRACTOR BEYLIK DRILLING, INC., LA HABRA, CALIFORNIA

DRILLING METHOD AND EQUIPMENT HSA, 4-1/4 ID, 8 OD, FAILING F-10

WATER LEVELS NOT ENCOUNTERED START 10/28/92 FINISH 10/28/92 LOGGER B. HARCESTY

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY (FT)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY SOIL STRUCTURE MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
40.0	40.0–42.0	4-MC	1.4	14-17-27-42	40-40.5 LEAN CLAY (CL), grayish brown moist, very stiff fine to medium sand 40.5-42 POORLY GRADED SAND WITH CLAY (SP-SC), grayish brown moist dense fine to medium grained	HNu=0 ppm OVA=0.4 ppm
45.0						
50.0	50.0–52.0	5-MC	1.75	20-20-28-35	LEAN CLAY WITH SAND (CL), grayish brown moist hard fine to coarse sand	HNu=0 ppm OVA=0.4 ppm
55.0						
60.0	60.0–62.0	6-MC	1.5	10-10-26-34	LEAN CLAY (CL), grayish brown moist hard trace silt trace fine sand	HNu=0 ppm OVA=2.0 ppm
					Total Depth at 62.0 Feet	
65.0						
70.0						

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, CA 92132-5187

Contract No. N68711-92-D-4670

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN II

FINAL ADDENDUM TO THE RCRA FACILITY ASSESSMENT MCAS EL TORO, CALIFORNIA (VOLUME 6 OF THE FINAL RFA REPORT)

CTO-0065/0170

May 1996

Prepared by:

BECHTEL NATIONAL, INC.
401 West A Street, Suite 1000
San Diego, CA 92101

Signature: _____ Date: 31 May 1996
Jacques Lord, CTO Leader

ACCUMULATION AREA EVALUATION CHECKLIST

(CIRCLE AS APPROPRIATE AND FILL IN COMPLETELY)

JOB 22214 CTO-0065
NAVY CLEAN II MCAS EL TORO RFA CONFIRMATION ACTIVITIES

GENERAL DESCRIPTION:

SWMU #: 224 Accumulation Area (AA) #: 771
Location (bldg): HWSA/Bldg. 771
Site Contact: Leta Suarez Ext: 2772
Permission for Access? (Y) ~~N~~ If yes, explain: locked fence around berm.
Type of Wastes Observed None

TYPE: (CIRCLE AS APPROPRIATE)

~~Locker~~ ~~Cabinet~~ (Pad) (Concrete) ~~/Soil/Asphalt~~ floor
(Berm) (Fence) Fence Type: Cyclone ~~Indoor~~
(Pallets) ~~Drum(s)~~ ~~No. of Drums:~~ (Outdoor)

CONDITION:

~~Stain(s)~~ ~~Odor(s)~~ ~~Crack(s)~~
Placards/Labels: ~~Y~~ (N) If Yes, list:

Observations: Clean concrete pad. Roof over pad. Vacant.
Status: No change, inactive as of 11-10-95.

DIMENSIONS: (ESTIMATED SIZE OR AREA IN FT)

AA/SWMU: 15x10 ft.
"Stain(s)" : None.
Any Restrictions To Access?: Fence, roof and poles.

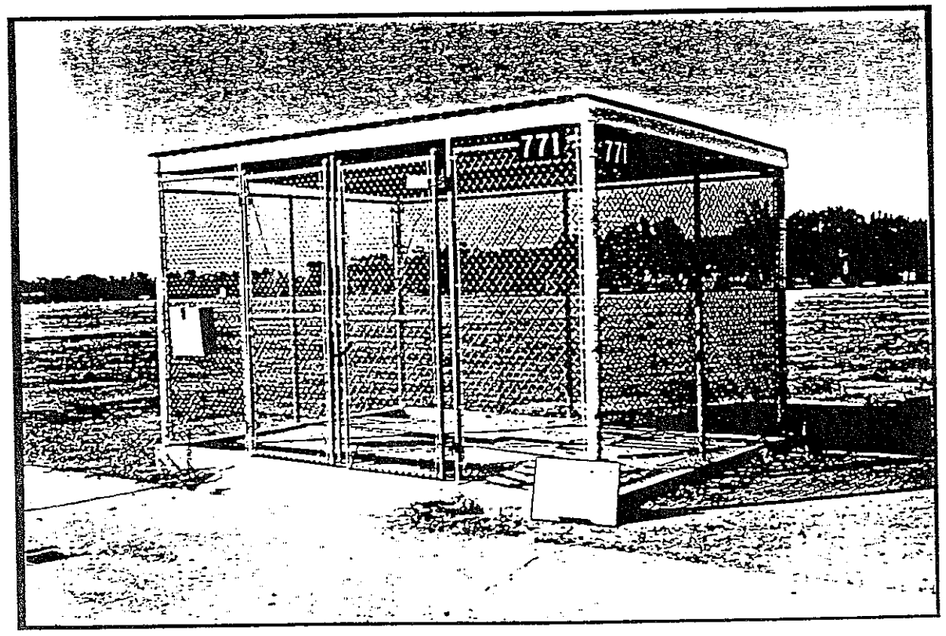
EVALUATION OF REMOVAL/DECONTAMINATION STRATEGY (CIRCLE AS APPROPRIATE)

Yes	(No)	Potential for release evident based on this surveillance
(Yes)	No	Potential for simple removal
Yes	(No)	Potential for decontamination activities prior to removal
Yes	(No)	Potential for sampling (describe:)
Yes	No	Potential for removal after additional assessment activities

SKETCH: (MAKE A SKETCH or ATTACH PHOTO(S) OF RELEVANT ACCESS, OBJECTS, WORK SPACE, ETC , AS APPROPRIATE, ON REVERSE OF THIS FORM)

DATE/TIME OF SURVEILLANCE: 12/6/94/11:40
UPDATED: 11-10-95
SURVEILLANCE PERFORMED BY: Larry Bauman

PHOTO LOG



SWMU #: 224

PHOTO DATE: 12-15-94

MARINE CORPS AIR STATION EL TORO
EL TORO, CALIFORNIA

INSTALLATION RESTORATION PROGRAM
DRAFT RESOURCE CONSERVATION
AND RECOVERY ACT (RCRA)
FACILITY ASSESSMENT REPORT

VOLUME III

16 July 1993

Evaluation Form
SWMU/Area of Concern
Number 42

Name: Drum Storage Area

Location: Near Building 130

Size: Approximately 100 sq ft

Date of Site Visit: 7 May 1991

Period of Operation

Currently active

Evaluation Form
SWMU/Area of Concern
Number 42

Unit Characteristics

Building 130 serves as an aircraft corrosion control facility Aircraft parts are stripped of old paint and repainted at this facility The DSA is located approximately 40 ft west of Building 130 The ground surface on the western side of Building 130 is concrete paved The DSA consists of a plastic lining surrounded by a sandbag berm approximate 1 to 2 ft in height The storage area measures approximately 10 x 10 ft in size. A chain link fence surrounds the entire storage area. The DSA is located atop a concrete surface. At the time of the VSI, one drum containing dirty rags was stored within the bermed area Four empty drums and a drum containing Dry-Sweep, for possible spills, were stored outside the bermed area. The DSA appeared in relatively good condition. No rips or stains were observed on the plastic lining.

A solvent tank, two waste storage drums, and four product drums of chromium were observed during the VSI on the western side of Building 130 These are discussed in Evaluation Form SWMU/Area of Concern Numbers 293, 294, and 295, respectively.

Waste Characteristics

Oily rags

Possible Migration Pathways

Storm drain system

Evidence of Release

None observed

Recommendations

Since the DSA is located on concrete that is neither stained nor cracked, no further action is recommended

ATTACHMENT 2

OHM AND SHAW ANALYTICAL DATA TABLES

Table 5
Summary of Analytical Results for Confirmation Soil Samples — Former TAA 771, MCAS El Toro, California

Sample Identification				818655-3398	818655-3399	818655-3400	818655-3401	818655-3250	818655-3251	818655-3252
Location Code				TAA771-SB-B1	TAA771-SB-B1	TAA771-SB-B2	TAA771-SB-B2	TAA771-SB-C1	TAA771-SB-D1	TAA771-SB-E1
Date Sampled				07/02/03	07/02/03	07/02/03	07/02/03	03/31/03	03/31/03	03/31/03
Depth (feet below ground surface)				2	4	2	4	3.0	3	3
	Unit	Background[1]	Residential PRG[2]							
TPH (EPA 8015M)										
Diesel	mg/kg	NE	NE	11 U	12 U	11 U	12 U	12 U	12 U	10 U
Gasoline	mg/kg	NE	NE	9.3 U	10 U	10 U	11 U	11 U	12 U	9.1 U
PESTICIDES (EPA 8081)										
4,4'-DDD	mg/kg	0.0361	2.4	.0045 U	.0047 U	.0042 U	.0047 U	.0048 U	.0049 U	.0041 U
4,4'-DDE	mg/kg	0.145	1.7	.0045 U	.0047 U	.0042 U	.0047 U	.0048 U	.0049 U	.0041 U
4,4'-DDT	mg/kg	0.236	1.7	.0045 U	.0047 U	.0042 U	.0047 U	.0048 U	.0049 U	.0041 U
Aldrin	mg/kg	NE	0.029	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Alpha-BHC	mg/kg	NE	0.090	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Alpha-chlordane	mg/kg	0.00224	1.6	.0022 U	.0023 U B	.0021 U	.0024 U B	.0024 U B	.0025 U B	.0021 U
Beta-BHC	mg/kg	NE	0.32	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Delta-BHC	mg/kg	NE	NE	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Dieldrin	mg/kg	0.0199	0.030	.0045 U	.0047 U	.0042 U	.0047 U	.0048 U	.0049 U	.0041 U
Endosulfan I	mg/kg	0.000179	370	.0045 U B	.0047 U B	.0042 U B	.0047 U B	.0048 U B	.0049 U B	.0041 U B
Endosulfan II	mg/kg	0.00222	370	.0045 U B	.0047 U B	.0042 U B	.0047 U B	.0048 U B	.0049 U B	.0041 U B
Endosulfan Sulfate	mg/kg	0.0031	NE	.0045 U B	.0047 U B	.0042 U B	.0047 U B	.0048 U B	.0049 U B	.0041 U B
Endrin	mg/kg	0.00222	18	.0034 U B	.0035 U B	.0032 U B	.0035 U B	.0036 U B	.0037 U B	.0031 U B
Endrin Aldehyde	mg/kg	0.00222	NE	.0045 U B	.0047 U B	.0042 U B	.0047 U B	.0048 U B	.0049 U B	.0041 U B
Endrin Ketone	mg/kg	NE	NE	.0034 U	.0035 U	.0032 U	.0035 U	.0036 U	.0037 U	.0031 U
gamma-BHC	mg/kg	NE	0.44	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
gamma-Chlordane	mg/kg	0.0027	1.6	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Heptachlor	mg/kg	NE	0.11	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Heptachlor Epoxide	mg/kg	NE	0.053	.0022 U	.0023 U	.0021 U	.0024 U	.0024 U	.0025 U	.0021 U
Methoxychlor	mg/kg	NE	300	.022 U	.023 U	.021 U	.024 U	.024 U	.025 U	.021 U
Toxaphene	mg/kg	NE	0.44	.11 U	.12 U	.11 U	.12 U	.12 U	.12 U	.1 U
VOLATILES (EPA 8260B)										
1,1,1-Trichloroethane	µg/kg	NE	1200000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
1,1,2,2-Tetrachloroethane	µg/kg	NE	410	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
1,1,2-Trichloroethane	µg/kg	NE	730	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
1,1-Dichloroethane	µg/kg	NE	510000 <2800>	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
1,1-Dichloroethene	µg/kg	NE	120000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
1,2-Dichloroethane	µg/kg	NE	280	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
1,2-Dichloropropane	µg/kg	NE	340	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
2-Butanone	µg/kg	NE	7300000	49 U	53 U	49 U	52 U	55 U	59 U	48 U
2-Chloroethyl Vinyl Ether	µg/kg	NE	NE	49 U	53 U	49 U	52 U	55 U	59 U	48 U
2-Hexanone	µg/kg	NE	NE	49 U	53 U	49 U	52 U	55 U	59 U	48 U
4-Methyl-2-Pentanone	µg/kg	NE	790000	49 U	53 U	49 U	52 U	55 U	59 U	48 U
Acetone	µg/kg	NE	1600000	26 J	37 J	14 J	29 J	55 U	59 U	48 U
Benzene	µg/kg	NE	600	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Bromodichloromethane	µg/kg	NE	820	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Bromoform	µg/kg	NE	62000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 UJ	5.9 U	4.8 U

Table 5
Summary of Analytical Results for Confirmation Soil Samples — Former TAA 771, MCAS El Toro, California

Sample Identification				818655-3398	818655-3399	818655-3400	818655-3401	818655-3250	818655-3251	818655-3252
Location Code				TAA771-SB-B1	TAA771-SB-B1	TAA771-SB-B2	TAA771-SB-B2	TAA771-SB-C1	TAA771-SB-D1	TAA771-SB-E1
Date Sampled				07/02/03	07/02/03	07/02/03	07/02/03	03/31/03	03/31/03	03/31/03
Depth (feet below ground surface)				2	4	2	4	3.0	3	3
	Unit	Background[1]	Residential PRG[2]							
Bromomethane	µg/kg	NE	3900	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Carbon Disulfide	µg/kg	NE	360000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Carbon Tetrachloride	µg/kg	NE	250	4.9 U	5.3 U	4.9 U	5.2 U	5.5 UJ	5.9 UJ	4.8 UJ
Chlorobenzene	µg/kg	NE	150000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Chloroethane	µg/kg	NE	3000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Chloroform	µg/kg	NE	3600 <940>	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Chloromethane	µg/kg	NE	1200	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
cis-1,2-Dichloroethene	µg/kg	NE	43000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
cis-1,3-Dichloropropene	µg/kg	NE	NE	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Dibromochloromethane	µg/kg	NE	1100	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Ethylbenzene	µg/kg	NE	8900	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Methyl tert-butyl ether (MTBE)	µg/kg	NE	62000 <17000>	9.8 U	11 U	9.9 U	10 U	11 U	12 U	9.6 U
Methylene Chloride	µg/kg	NE	9100	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Styrene	µg/kg	NE	1700000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Tetrachloroethene	µg/kg	NE	1500	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Toluene	µg/kg	NE	520000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
trans-1,2-Dichloroethene	µg/kg	NE	69000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
trans-1,3-Dichloropropene	µg/kg	NE	780	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Trichloroethene	µg/kg	NE	53	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Vinyl Acetate	µg/kg	NE	430000	49 U	53 U	49 U	52 U	55 U	59 U	48 U
Vinyl Chloride	µg/kg	NE	79	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
Xylene, (Total)	µg/kg	NE	270000	4.9 U	5.3 U	4.9 U	5.2 U	5.5 U	5.9 U	4.8 U
SEMI-VOLATILES (EPA 8270C)										
1,2,4-Trichlorobenzene	µg/kg	NE	650000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
1,2-Dichlorobenzene	µg/kg	NE	370000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
1,3-Dichlorobenzene	µg/kg	NE	16000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
1,4-Dichlorobenzene	µg/kg	NE	3400	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2,4,5-Trichlorophenol	µg/kg	NE	6100000	930 U	970 U	880 U	980 U	1000 U	1000 U	860 U
2,4,6-Trichlorophenol	µg/kg	NE	6100 <6900>	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2,4-Dichlorophenol	µg/kg	NE	180000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2,4-Dimethylphenol	µg/kg	NE	1200000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2,4-Dinitrophenol	µg/kg	NE	120000	930 U	970 U	880 U	980 U	1000 UJ	1000 UJ	860 UJ
2,4-Dinitrotoluene	µg/kg	NE	120000	370 U	390 U	350 U	390 U	400 UJ	410 UJ	340 UJ
2,6-Dinitrotoluene	µg/kg	NE	61000	370 U	390 U	350 U	390 U	400 UJ	410 UJ	340 UJ
2-Chloronaphthalene	µg/kg	NE	4900000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2-Chlorophenol	µg/kg	NE	63000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2-Methylnaphthalene	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2-Methylphenol	µg/kg	NE	3000000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
2-Nitroaniline	µg/kg	NE	1700	930 U	970 U	880 U	980 U	1000 U	1000 U	860 U
2-Nitrophenol	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
3,3'-Dichlorobenzidine	µg/kg	NE	1100	370 U	390 U	350 U	390 U	400 U	410 U	340 U

Table 5
Summary of Analytical Results for Confirmation Soil Samples — Former TAA 771, MCAS El Toro, California

Sample Identification				818655-3398	818655-3399	818655-3400	818655-3401	818655-3250	818655-3251	818655-3252
Location Code				TAA771-SB-B1	TAA771-SB-B1	TAA771-SB-B2	TAA771-SB-B2	TAA771-SB-C1	TAA771-SB-D1	TAA771-SB-E1
Date Sampled				07/02/03	07/02/03	07/02/03	07/02/03	03/31/03	03/31/03	03/31/03
Depth (feet below ground surface)				2	4	2	4	3.0	3	3
	Unit	Background[1]	Residential PRG[2]							
3-Nitroaniline	µg/kg	NE	NE	930 U	970 U	880 U	980 U	1000 U	1000 U	860 U
4,6-Dinitro-2-Methylphenol	µg/kg	NE	NE	930 U	970 U	880 U	980 U	1000 UJ	1000 UJ	860 UJ
4-Bromophenyl Phenyl Ether	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
4-Chloro-3-Methylphenol	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
4-Chloroaniline	µg/kg	NE	240000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
4-Chlorophenyl Phenyl Ether	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
4-Methylphenol	µg/kg	NE	310000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
4-Nitroaniline	µg/kg	NE	NE	930 U	970 U	880 U	980 U	1000 U	1000 U	860 U
4-Nitrophenol	µg/kg	NE	NE	930 U	970 U	880 U	980 U	1000 U	1000 U	860 U
Acenaphthene	µg/kg	NE	3700000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Acenaphthylene	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Anthracene	µg/kg	NE	22000000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Benzo(a)anthracene	µg/kg	22	620	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Benzo(a)pyrene	µg/kg	27	62	37 U B	39 U B	35 U B	39 U B	40 U B	41 U B	34 U B
Benzo(b)fluoranthene	µg/kg	28	620	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Benzo(ghi)perylene	µg/kg	29	NE	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Benzo(k)fluoranthene	µg/kg	24	6200 <380>	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Bis(2-Chloroethoxy)Methane	µg/kg	NE	NE	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Bis(2-Chloroethyl)Ether	µg/kg	NE	210	37 U	39 U	35 U	39 U	40 U	41 U	34 U
Bis(2-Chloroisopropyl)Ether	µg/kg	NE	2900	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Bis(2-Ethylhexyl)Phthalate	µg/kg	NE	35000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Butyl Benzyl Phthalate	µg/kg	NE	12000000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Chrysene	µg/kg	31	62000 <3800>	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Di-n-Butyl Phthalate	µg/kg	NE	6100000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Di-n-Octyl Phthalate	µg/kg	NE	2400000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Dibenzo(a,h)Anthracene	µg/kg	8	62	37 U B	39 U B	35 U B	39 U B	40 U B	41 U B	34 U B
Dibenzofuran	µg/kg	NE	290000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Diethyl Phthalate	µg/kg	NE	49000000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Dimethyl Phthalate	µg/kg	NE	100000000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Fluoranthene	µg/kg	45	2300000	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Fluorene	µg/kg	NE	2700000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Hexachlorobenzene	µg/kg	NE	300	84 U	88 U	80 U	88 U	90 U	92 U	77 U
Hexachlorobutadiene	µg/kg	NE	6200	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Hexachlorocyclopentadiene	µg/kg	NE	370000	370 U	390 U	350 U	390 U	400 UJ	410 UJ	340 UJ
Hexachloroethane	µg/kg	NE	35000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Indeno(1,2,3-CD)Pyrene	µg/kg	21	620	39 U B	41 U B	37 U B	41 U B	42 U B	43 U B	36 U B
n-Nitroso-Di-N-Propylamine	µg/kg	NE	69	37 U	39 U	35 U	39 U	40 U	41 U	34 U
n-Nitrosodiphenylamine	µg/kg	NE	99000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Naphthalene	µg/kg	NE	56000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Nitrobenzene	µg/kg	NE	20000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Pentachlorophenol	µg/kg	NE	3000	220 U	230 U	210 U	240 U	240 U	250 U	210 U

Table 5
Summary of Analytical Results for Confirmation Soil Samples — Former TAA 771, MCAS El Toro, California

Sample Identification				818655-3398	818655-3399	818655-3400	818655-3401	818655-3250	818655-3251	818655-3252
Location Code				TAA771-SB-B1	TAA771-SB-B1	TAA771-SB-B2	TAA771-SB-B2	TAA771-SB-C1	TAA771-SB-D1	TAA771-SB-E1
Date Sampled				07/02/03	07/02/03	07/02/03	07/02/03	03/31/03	03/31/03	03/31/03
Depth (feet below ground surface)				2	4	2	4	3.0	3	3
	Unit	Background[1]	Residential PRG[2]							
Phenanthrene	µg/kg	18	NE	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
Phenol	µg/kg	NE	37000000	370 U	390 U	350 U	390 U	400 U	410 U	340 U
Pyrene	µg/kg	41	2300000	370 U B	390 U B	350 U B	390 U B	400 U B	410 U B	340 U B
METALS (EPA 6010B)										
Aluminum	mg/kg	14800	76000	16300 J B	25700 B	8550	28700 B	20400 J B	27200 B	6420
Antimony	mg/kg	3.06	31	3.67 U B	2.48 U	3.32 U B	5.89 U B	6 UJ B	6.15 U B	5.16 U B
Arsenic	mg/kg	6.86	0.39	2.92 Y	3.68 Y	1.65 Y	5.04 Y	4.34 Y	3.86 Y	3.2 Y
Barium	mg/kg	173	5400	156	164	80.9	184 B	169	173 B	134
Beryllium	mg/kg	0.669	150	.577	.86 B	.324	1.03 B	.811 B	.857 B	.3
Cadmium	mg/kg	2.35	37 <1.7>	.517 J	.534 J	.531 U	.509 J	.466 J	.705	0.516 U
Calcium	mg/kg	46000	NE	10800	7250	6230	6320	7130	6190	6760
Chromium	mg/kg	26.9	210	12.9	19.5	7.52	25.3	18.2	19	6.33
Cobalt	mg/kg	6.98	900	6.17	9.04 B	3.64	10.4 B	9.14 B	9.56 B	2.59
Copper	mg/kg	10.5	3100	6.81	10.2	3.87	11.8 B	11.2 J B	12.7 B	4.54
Iron	mg/kg	18400	23000	14600 J	21800 B	8360	25300 B Y	22600 J B	23100 B Y	7190
Lead	mg/kg	15.1	400 <150>	2.67	3.71	1.64	4.1	4.87	4.48	2.09
Magnesium	mg/kg	8370	NE	6470	10700 B	3700	11600 B	9920 B	10800 B	3190
Manganese	mg/kg	291	1800	237	300 B	147	327 B	331 J B	345 B	146
Mercury	mg/kg	0.22	NE	.112 U	.117 U	.106 U	.118 U	.12 U	.123 U	.103 U
Molybdenum	mg/kg	NE	390	5.59 U	5.87 U	5.31 U	5.89 U	.988 U	6.15 U	5.16 U
Nickel	mg/kg	15.3	1600	7.34	11.2	4.19	14.8	10.7 J	10	3.64
Potassium	mg/kg	4890	NE	3670	5340 B	2090	6740 B	6190 B	7000 B	1580
Selenium	mg/kg	0.32	390	1.12 U B	1.17 U B	1.06 U B	1.18 U B	.59 J B	.68 J B	1.03 U B
Silver	mg/kg	0.539	390	2.23 U B	2.35 U B	2.12 U B	2.36 U B	2.4 U B	2.46 U B	2.06 U B
Sodium	mg/kg	405	NE	160 U	213	140 U	398	277	184	116
Thallium	mg/kg	0.42	5.2	1.01 J B	1.72 B	1.06 U B	1.88 B	.793 J B	1.16 J B	1.03 U B
Vanadium	mg/kg	71.8	550	42.2	60.6	23.9	82.3 B	58.6	60.5	23.1
Zinc	mg/kg	77.9	23000	41.3 J	60.2	23.2	73.6	61.1 J	66.9	20.4

[1] Bechtel National, Inc., 1996, Draft Report Anthropogenic PAH Reference-Level Study Marine Corps Air Station, El Toro, California, May.
Bechtel National, Inc., 1996, Final Technical Memorandum Background and Reference Levels Remedial Investigations, Marine Corps Air Station, El Toro, California, October.
[2] EPA Region IX, 2002, Preliminary Remedial Goals (PRG), October.

B - result exceeds background
J - estimated value
M - modified
MCAS - Marine Corps Air Station
mg/kg - milligrams per kilogram
NE - not established
PRG - preliminary remedial goals
TPH - total petroleum hydrocarbons
U - not detected at or above the stated reporting limit
UJ - estimated reporting limit
Y - result exceeds residential PRGs
µg/kg - micrograms per kilogram
< > - California Modified preliminary remedial goal
( ) - laboratory method detection limit

Table 6
Summary of Analytical Results for Field QC Samples — TAA 771, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3253 Equipment Rinsate 03/31/03	818655-3246 Trip Blank 03/31/03	818655-3402 Equipment Rinsate 07/02/03
	Unit			
TPH (EPA 8015M)				
Diesel	mg/L	.095 U	NA	.094 U
Gasoline	mg/L	.1 U	NA	.0098 J
Pesticides (EPA 8081)				
4,4'-DDD	µg/L	.19 U	NA	.19 U
4,4'-DDE	µg/L	.19 U	NA	.19 U
4,4'-DDT	µg/L	.19 U	NA	.19 U
Aldrin	µg/L	.094 U	NA	.094 U
alpha-BHC	µg/L	.094 U	NA	.094 U
alpha-Chlordane	µg/L	.094 U	NA	.094 U
beta-BHC	µg/L	.094 U	NA	.094 U
delta-BHC	µg/L	.094 U	NA	.094 U
Drieldrin	µg/L	.19 U	NA	.19 U
Endosulfan I	µg/L	.094 U	NA	.094 U
Endosulfan II	µg/L	.19 U	NA	.19 U
Endosulfan Sulfate	µg/L	.19 U	NA	.19 U
Endrin	µg/L	.094 U	NA	.094 U
Endrin Aldehyde	µg/L	.19 U	NA	.19 U
Endrin Ketone	µg/L	.094 U	NA	.094 U
gamma-BHC	µg/L	.094 U	NA	.094 U
gamma-Chlordane	µg/L	.094 U	NA	.094 UJ
Heptachlor	µg/L	.094 U	NA	.094 U
Heptachlor Epoxide	µg/L	.094 U	NA	.094 U
Methoxychlor	µg/L	.94 U	NA	.94 U
Toxaphene	µg/L	2.8 U	NA	2.8 U
VOLATILES (EPA 8260B)				
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U

Table 6
Summary of Analytical Results for Field QC Samples — TAA 771, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3253 Equipment Rinsate 03/31/03	818655-3246 Trip Blank 03/31/03	818655-3402 Equipment Rinsate 07/02/03
	Unit			
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U
2-Butanone	µg/L	50 U	50 U	50 U
2-Chloroethyl vinyl ether	µg/L	50 U	50 U	50 U
2-Hexanone	µg/L	50 U	50 U	50 U
4-Methyl-2-pentanone	µg/L	50 U	50 U	50 U
Acetone	µg/L	50 U	50 U	50 U
Benzene	µg/L	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U
Bromomethane	µg/L	5 U	5 U	5 U
Carbon disulfide	µg/L	5 U	5 U	5 U
Carbon tetrachloride	µg/L	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U
Chloroethane	µg/L	5 U	5 U	5 U
Chloroform	µg/L	5 U	5 U	5 U
Chloromethane	µg/L	5 U	5 U	5 U
Cis-1,2-Dichloroethene	µg/L	5 U	5 U	5 U
Cis-1,3-Dichloropropene	µg/L	5 U	5 U	5 U
Dibromochloromethane	µg/L	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U
Methyl tert-butyl ether	µg/L	10 U	10 U	10 U
Methylene chloride	µg/L	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U

Table 6
Summary of Analytical Results for Field QC Samples — TAA 771, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3253 Equipment Rinsate 03/31/03	818655-3246 Trip Blank 03/31/03	818655-3402 Equipment Rinsate 07/02/03
	Unit			
Toluene	µg/L	5 U	5 U	5 U
Trans-1,2-Dichloroethene	µg/L	5 U	5 U	5 U
Trans-1,3-Dichloropropene	µg/L	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U
Vinyl acetate	µg/L	50 U	50 U	50 U
Vinyl chloride	µg/L	5 U	5 U	5 U
Xylene, (total)	µg/L	5 U	5 U	5 U
SEMI-VOLATILES (EPA 8270C)				
1,2,4-Trichlorobenzene	µg/L	9.6 U	NA	9.4 U
1,2-Dichlorobenzene	µg/L	9.6 U	NA	9.4 U
1,3-Dichlorobenzene	µg/L	9.6 U	NA	9.4 U
1,4-Dichlorobenzene	µg/L	9.6 U	NA	9.4 U
2,4,5-Trichlorophenol	µg/L	24 U	NA	24 U
2,4,6-Trichlorophenol	µg/L	9.6 U	NA	9.4 U
2,4-Dichlorophenol	µg/L	9.6 U	NA	9.4 U
2,4-Dimethylphenol	µg/L	9.6 U	NA	9.4 U
2,4-Dinitrophenol	µg/L	24 U	NA	24 U
2,4-Dinitrotoluene	µg/L	9.6 U	NA	9.4 U
2,6-Dinitrotoluene	µg/L	9.6 U	NA	9.4 U
2-Chloronaphthalene	µg/L	9.6 U	NA	9.4 U
2-Chlorophenol	µg/L	9.6 U	NA	9.4 U
2-Methylnaphthalene	µg/L	9.6 U	NA	9.4 U
2-Methylphenol	µg/L	9.6 U	NA	9.4 U
2-Nitroaniline	µg/L	24 U	NA	24 U
2-Nitrophenol	µg/L	9.6 U	NA	9.4 U
3,3'-Dichlorobenzidine	µg/L	9.6 U	NA	9.4 U
3-Nitroaniline	µg/L	24 U	NA	24 U
4,6-Dinitro-2-Methylphenol	µg/L	24 U	NA	24 U

Table 6
Summary of Analytical Results for Field QC Samples — TAA 771, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3253 Equipment Rinsate 03/31/03	818655-3246 Trip Blank 03/31/03	818655-3402 Equipment Rinsate 07/02/03
	Unit			
4-Bromophenyl Phenyl Ether	µg/L	9.6 U	NA	9.4 U
4-Chloro-3-Methylphenol	µg/L	9.6 U	NA	9.4 U
4-Chloroaniline	µg/L	9.6 U	NA	9.4 U
4-Chlorophenyl Phenyl Ether	µg/L	9.6 U	NA	9.4 U
4-Methylphenol	µg/L	9.6 U	NA	9.4 U
4-Nitroaniline	µg/L	24 U	NA	24 U
4-Nitrophenol	µg/L	24 U	NA	24 U
Acenaphthene	µg/L	9.6 U	NA	9.4 U
Acenaphthylene	µg/L	9.6 U	NA	9.4 U
Anthracene	µg/L	9.6 U	NA	9.4 U
Benzo(A)Anthracene	µg/L	9.6 U	NA	9.4 U
Benzo(A)Pyrene	µg/L	9.6 U	NA	9.4 U
Benzo(B)Fluoranthene	µg/L	9.6 U	NA	9.4 U
Benzo(Ghi)Perylene	µg/L	9.6 U	NA	9.4 U
Benzo(K)Fluoranthene	µg/L	9.6 U	NA	9.4 U
Bis(2-Chloroethoxy)Methane	µg/L	9.6 U	NA	9.4 U
Bis(2-Chloroethyl)Ether	µg/L	9.6 U	NA	9.4 U
Bis(2-Chloroisopropyl)Ether	µg/L	9.6 U	NA	9.4 U
Bis(2-Ethylhexyl)Phthalate	µg/L	19 U	NA	19 U
Butyl Benzyl Phthalate	µg/L	9.6 U	NA	9.4 U
Chrysene	µg/L	9.6 U	NA	9.4 U
Di-N-Butyl Phthalate	µg/L	9.6 U	NA	9.4 U
Di-N-Octyl Phthalate	µg/L	9.6 U	NA	9.4 U
Dibenzo(a,h)Anthracene	µg/L	9.6 U	NA	9.4 U
Dibenzofuran	µg/L	9.6 U	NA	9.4 U
Diethyl Phthalate	µg/L	9.6 U	NA	9.4 U
Dimethyl Phthalate	µg/L	9.6 U	NA	9.4 U
Fluoranthene	µg/L	9.6 U	NA	9.4 U

Table 6
Summary of Analytical Results for Field QC Samples — TAA 771, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3253 Equipment Rinsate 03/31/03	818655-3246 Trip Blank 03/31/03	818655-3402 Equipment Rinsate 07/02/03
	Unit			
Fluorene	µg/L	9.6 U	NA	9.4 U
Hexachlorobenzene	µg/L	9.6 U	NA	9.4 U
Hexachlorobutadiene	µg/L	9.6 U	NA	9.4 U
Hexachlorocyclopentadiene	µg/L	9.6 U	NA	9.4 U
Hexachloroethane	µg/L	9.6 U	NA	9.4 U
Indeno(1,2,3-Cd)Pyrene	µg/L	9.6 U	NA	9.4 U
N-Nitroso-Di-N-Propylamine	µg/L	9.6 U	NA	9.4 U
N-Nitrosodiphenylamine	µg/L	9.6 U	NA	9.4 U
Naphthalene	µg/L	9.6 U	NA	9.4 U
Nitrobenzene	µg/L	9.6 U	NA	9.4 U
Pentachlorophenol	µg/L	9.6 U	NA	9.4 U
Phenanthrene	µg/L	9.6 U	NA	9.4 U
Phenol	µg/L	9.6 U	NA	9.4 U
Pyrene	µg/L	9.6 U	NA	9.4 U
METALS (EPA 6010B)				
Aluminum	µg/L	500 U	NA	500 U
Antimony	µg/L	500 U	NA	500 U
Arsenic	µg/L	5 U	NA	5 U
Barium	µg/L	100 U	NA	100 U
Beryllium	µg/L	10 U	NA	10 U
Cadmium	µg/L	5 U	NA	5 U
Calcium	µg/L	58.2 J	NA	1000 U
Chromium	µg/L	50 U	NA	50 U
Cobalt	µg/L	50 U	NA	50 U
Copper	µg/L	50 U	NA	50 U
Iron	µg/L	31.9 J	NA	1000 U
Lead	µg/L	5 U	NA	5 U
Magnesium	µg/L	1000 U	NA	1000 U

Table 6
Summary of Analytical Results for Field QC Samples — TAA 771, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3253 Equipment Rinsate 03/31/03	818655-3246 Trip Blank 03/31/03	818655-3402 Equipment Rinsate 07/02/03
	Unit			
Manganese	µg/L	20 U	NA	20 U
Mercury	µg/L	.2 U	NA	.2 U
Molybdenum	µg/L	100 U	NA	100 U
Nickel	µg/L	150 U	NA	150 U
Potassium	µg/L	5000 U	NA	5000 U
Selenium	µg/L	5 U	NA	5 U
Silver	µg/L	50 U	NA	50 U
Sodium	µg/L	227 J	NA	1000 U
Thallium	µg/L	10 U	NA	10 U
Vanadium	µg/L	100 U	NA	100 U
Zinc	µg/L	20 U	NA	5.97 J

J - estimated value
M - modified
MCAS - Marine Corps Air Station
mg/L - milligrams per liter
NA - not analyzed
QC - quality control
TPH - total petroleum hydrocarbons
U - not detected at or above the stated reporting limit
UJ - estimated reporting limit
µg/L - micrograms per liter

Table 1
Analytical Results for Soil Samples — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled Depth (feet below ground surface)				818655-3390 TAA130C-SB-B 06/23/03 1.5	818655-3391 TAA130C-SB-B 06/23/03 3	818655-3392 TAA130C-SB-C1 06/23/03 2	818655-3393 TAA130C-SB-C2 06/23/03 3	818655-3394 TAA130C-SB-A 06/23/03 4	818655-3395 TAA130C-SB-A 06/23/03 5.5
	Unit	Background[1]	Residential PRG[2]						
TPH (EPA 8015M)									
Diesel	mg/kg	NE	NE	11 U	11 U	11 U	11 U	10 U	11 U
Gasoline	mg/kg	NE	NE	12 U	11 U	10 U	11 U	9.7 U	10 U
PESTICIDES (EPA 8081A)									
4,4'-DDD	mg/kg	0.0361	2.4	0.0044 U	.0046 U	.16 J B	.0029 J	.0042 U	.0043 U
4,4'-DDE	mg/kg	0.145	1.7	0.0044 U	.0046 UJ	.029 J	.0081	.0042 U	.0043 U
4,4'-DDT	mg/kg	0.236	1.7	0.0025 J	.0046 UJ	1.1 B	.011	.0042 U	.0043 U
Aldrin	mg/kg	NE	0.029	0.0022 U	.0023 U	.0022 U	.0022 U	.0021 U	.0021 U
Alpha-BHC	mg/kg	NE	0.090	0.0022 U	.0023 U	.0022 U	.0022 UJ	.00064 J	.0021 U
Alpha-Chlordane	mg/kg	0.00224	1.6	0.0022 U	.0023 UJ B	.0024 B	.0022 U	.0021 U	.0021 U
Beta-BHC	mg/kg	NE	0.32	0.0022 U	.0023 U	.0022 U	.0022 U	.0021 U	.0021 U
Delta-BHC	mg/kg	NE	NE	0.0022 U	.0023 U	.0022 UJ	.0022 U	.0021 U	.0021 U
Dieldrin	mg/kg	0.0199	0.030	0.0044 UJ	.0046 U	.0043 UJ	.0043 U	.0042 U	.0043 U
Endosulfan I	mg/kg	0.000179	370	0.0044 U B	.0046 U B	.0043 UJ B	.0043 U B	.0042 U B	.0043 U B
Endosulfan II	mg/kg	0.00222	370	0.0044 U B	.0046 UJ B	.0043 U B	.0043 UJ B	.0042 U B	.0043 U B
Endosulfan Sulfate	mg/kg	0.0031	NE	0.0044 U B	.0046 UJ B	.0043 U B	.0043 U B	.0042 U B	.0043 U B
Endrin	mg/kg	0.00222	18	0.0033 U B	.0034 U B	.0033 U B	.0033 U B	.0031 U B	.0032 U B
Endrin Aldehyde	mg/kg	0.00222	NE	0.0044 U B	.0046 U B	.0043 U B	.0043 U B	.0042 U B	.0043 U B
Endrin Ketone	mg/kg	NE	NE	0.0033 U	.0034 UJ	.0033 U	.0033 U	.0031 U	.0032 U
Gamma-BHC	mg/kg	NE	0.44	0.0022 U	.0023 U	.0022 UJ	.0022 U	.0021 U	.0021 U
Gamma-Chlordane	mg/kg	0.0027	1.6	0.0022 U	.0023 UJ	.0022 UJ	.0022 UJ	.0021 U	.0021 U
Heptachlor	mg/kg	NE	0.11	0.0022 U	.0023 U	.0022 U	.0022 U	.0021 U	.0021 U
Heptachlor Epoxide	mg/kg	NE	0.053	0.0022 U	.00043 J	.0062	.0022 U	.0021 U	.0021 U
Methoxychlor	mg/kg	NE	300	0.022 U	.023 U	.022 U	.022 U	.021 U	.021 U
Toxaphene	mg/kg	NE	0.44	0.11 U	.11 U	.11 U	.11 U	.1 U	.11 U
VOLATILES (EPA 8260B)									
1,1,1-Trichloroethane	µg/kg	NE	1200000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
1,1,2,2-Tetrachloroethane	µg/kg	NE	410	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
1,1,2-Trichloroethane	µg/kg	NE	730	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
1,1-Dichloroethane	µg/kg	NE	510000 <2800>	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
1,1-Dichloroethene	µg/kg	NE	120000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
1,2-Dichloroethane	µg/kg	NE	280	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
1,2-Dichloropropane	µg/kg	NE	340	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
2-Butanone	µg/kg	NE	7300000	78 U	57 U	51 U	53 U	49 U	52 U
2-Chloroethyl Vinyl Ether	µg/kg	NE	NE	78 U	57 U	51 U	53 U	49 U	52 U
2-Hexanone	µg/kg	NE	NE	78 U	57 U	51 U	53 U	49 U	52 U
4-Methyl-2-Pentanone	µg/kg	NE	790000	78 U	57 U	51 U	53 U	49 U	52 U
Acetone	µg/kg	NE	1600000	28 J	16 J	40 J	40 J	17 J	29 J

Table 1
Analytical Results for Soil Samples — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled Depth (feet below ground surface)				818655-3390 TAA130C-SB-B 06/23/03 1.5	818655-3391 TAA130C-SB-B 06/23/03 3	818655-3392 TAA130C-SB-C1 06/23/03 2	818655-3393 TAA130C-SB-C2 06/23/03 3	818655-3394 TAA130C-SB-A 06/23/03 4	818655-3395 TAA130C-SB-A 06/23/03 5.5
	Unit	Background[1]	Residential PRG[2]						
Benzene	µg/kg	NE	600	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Bromodichloromethane	µg/kg	NE	820	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Bromoform	µg/kg	NE	62000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Bromomethane	µg/kg	NE	3900	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Carbon Disulfide	µg/kg	NE	360000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Carbon Tetrachloride	µg/kg	NE	250	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Chlorobenzene	µg/kg	NE	150000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Chloroethane	µg/kg	NE	3000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Chloroform	µg/kg	NE	3600 <940>	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Chloromethane	µg/kg	NE	1200	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Cis-1,2-Dichloroethene	µg/kg	NE	43000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Cis-1,3-Dichloropropene	µg/kg	NE	780	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Dibromochloromethane	µg/kg	NE	1100	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Ethylbenzene	µg/kg	NE	8900	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Methyl Tert-Butyl Ether	µg/kg	NE	62000 <17000>	16 U	11 U	10 U	11 U	9.8 U	10 U
Methylene Chloride	µg/kg	NE	9100	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Styrene	µg/kg	NE	1700000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Tetrachloroethene	µg/kg	NE	1500	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Toluene	µg/kg	NE	520000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Trans-1,2-Dichloroethene	µg/kg	NE	69000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Trans-1,3-Dichloropropene	µg/kg	NE	780	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Trichloroethene	µg/kg	NE	53	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Vinyl Acetate	µg/kg	NE	430000	78 U	57 U	51 U	53 U	49 U	52 U
Vinyl Chloride	µg/kg	NE	79	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
Xylene, (Total)	µg/kg	NE	270000	7.8 U	5.7 U	5.1 U	5.3 U	4.9 U	5.2 U
SEMI-VOLATILES (EPA 8270C)									
1,2,4-Trichlorobenzene	µg/kg	NE	650000	370 U	380 U	360 U	360 U	340 U	350 U
1,2-Dichlorobenzene	µg/kg	NE	370000	370 U	380 U	360 U	360 U	340 U	350 U
1,3-Dichlorobenzene	µg/kg	NE	16000	370 U	380 U	360 U	360 U	340 U	350 U
1,4-Dichlorobenzene	µg/kg	NE	3400	370 U	380 U	360 U	360 U	340 U	350 U
2,4,5-Trichlorophenol	µg/kg	NE	6100000	920 U	950 U	900 U	900 U	870 U	880 U
2,4,6-Trichlorophenol	µg/kg	NE	6100 <6900>	370 U	380 U	360 U	360 U	340 U	350 U
2,4-Dichlorophenol	µg/kg	NE	180000	370 U	380 U	360 U	360 U	340 U	350 U
2,4-Dimethylphenol	µg/kg	NE	1200000	370 U	380 U	360 U	360 U	340 U	350 U
2,4-Dinitrophenol	µg/kg	NE	120000	920 U	950 U	900 U	900 U	870 U	880 U
2,4-Dinitrotoluene	µg/kg	NE	120000	370 U	380 U	360 U	360 U	340 U	350 U
2,6-Dinitrotoluene	µg/kg	NE	61000	370 U	380 U	360 U	360 U	340 U	350 U
2-Chloronaphthalene	µg/kg	NE	4900000	370 U	380 U	360 U	360 U	340 U	350 U

Table 1
Analytical Results for Soil Samples — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled Depth (feet below ground surface)				818655-3390 TAA130C-SB-B 06/23/03 1.5	818655-3391 TAA130C-SB-B 06/23/03 3	818655-3392 TAA130C-SB-C1 06/23/03 2	818655-3393 TAA130C-SB-C2 06/23/03 3	818655-3394 TAA130C-SB-A 06/23/03 4	818655-3395 TAA130C-SB-A 06/23/03 5.5
	Unit	Background[1]	Residential PRG[2]						
2-Chlorophenol	µg/kg	NE	63000	370 U	380 U	360 U	360 U	340 U	350 U
2-Methylnaphthalene	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
2-Methylphenol	µg/kg	NE	3000000	370 U	380 U	360 U	360 U	340 U	350 U
2-Nitroaniline	µg/kg	NE	1700	920 U	950 U	900 U	900 U	870 U	880 U
2-Nitrophenol	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
3,3'-Dichlorobenzidine	µg/kg	NE	1100	370 U	380 U	360 U	360 U	340 U	350 U
3-Nitroaniline	µg/kg	NE	NE	920 U	950 U	900 U	900 U	870 U	880 U
4,6-Dinitro-2-Methylphenol	µg/kg	NE	NE	920 U	950 U	900 U	900 U	870 U	880 U
4-Bromophenyl Phenyl Ether	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
4-Chloro-3-Methylphenol	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
4-Chloroaniline	µg/kg	NE	240000	370 U	380 U	360 U	360 U	340 U	350 U
4-Chlorophenyl Phenyl Ether	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
4-Methylphenol	µg/kg	NE	310000	370 U	380 U	360 U	360 U	340 U	350 U
4-Nitroaniline	µg/kg	NE	NE	920 U	950 U	900 U	900 U	870 U	880 U
4-Nitrophenol	µg/kg	NE	NE	920 U	950 U	900 U	900 U	870 U	880 U
Acenaphthene	µg/kg	NE	3700000	370 U	380 U	360 U	360 U	340 U	350 U
Acenaphthylene	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
Anthracene	µg/kg	NE	22000000	370 U	380 U	360 U	360 U	340 U	350 U
Benzo(A)Anthracene	µg/kg	22	620	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Benzo(B)Fluoranthene	µg/kg	28	620	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Benzo(Ghi)Perylene	µg/kg	29	NE	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Benzo(K)Fluoranthene	µg/kg	24	6200 <380>	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Bis(2-Chloroethoxy)Methane	µg/kg	NE	NE	370 U	380 U	360 U	360 U	340 U	350 U
Bis(2-Chloroisopropyl)Ether	µg/kg	NE	2900	370 U	380 U	360 U	360 U	340 U	350 U
Bis(2-Ethylhexyl)Phthalate	µg/kg	NE	35000	370 U	380 U	360 U	360 U	340 U	350 U
Butyl Benzyl Phthalate	µg/kg	NE	12000000	370 U	380 U	360 U	360 U	340 U	350 U
Chrysene	µg/kg	31	62000 <3800>	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Di-N-Butyl Phthalate	µg/kg	NE	6100000	370 U	380 U	360 U	360 U	340 U	350 U
Di-N-Octyl Phthalate	µg/kg	NE	2400000	370 U	380 U	360 U	360 U	340 U	350 U
Dibenzofuran	µg/kg	NE	290000	370 U	380 U	360 U	360 U	340 U	350 U
Diethyl Phthalate	µg/kg	NE	49000000	370 U	380 U	360 U	360 U	340 U	350 U
Dimethyl Phthalate	µg/kg	NE	100000000	370 U	380 U	360 U	360 U	340 U	350 U
Fluoranthene	µg/kg	45	2300000	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Fluorene	µg/kg	NE	2700000	370 U	380 U	360 U	360 U	340 U	350 U
Hexachlorobutadiene	µg/kg	NE	6200	370 U	380 U	360 U	360 U	340 U	350 U
Hexachlorocyclopentadiene	µg/kg	NE	370000	370 U	380 U	360 U	360 U	340 U	350 U
Hexachloroethane	µg/kg	NE	35000	370 U	380 U	360 U	360 U	340 U	350 U
N-Nitrosodiphenylamine	µg/kg	NE	99000	370 U	380 U	360 U	360 U	340 U	350 U

Table 1
Analytical Results for Soil Samples — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled Depth (feet below ground surface)				818655-3390 TAA130C-SB-B 06/23/03 1.5	818655-3391 TAA130C-SB-B 06/23/03 3	818655-3392 TAA130C-SB-C1 06/23/03 2	818655-3393 TAA130C-SB-C2 06/23/03 3	818655-3394 TAA130C-SB-A 06/23/03 4	818655-3395 TAA130C-SB-A 06/23/03 5.5
	Unit	Background[1]	Residential PRG[2]						
Naphthalene	µg/kg	NE	56000	370 U	380 U	360 U	360 U	340 U	350 U
Nitrobenzene	µg/kg	NE	20000	370 U	380 U	360 U	360 U	340 U	350 U
Pentachlorophenol	µg/kg	NE	3000	220 U	230 U	220 U	220 U	210 U	210 U
Phenanthrene	µg/kg	18	NE	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
Phenol	µg/kg	NE	37000000	370 U	380 U	360 U	360 U	340 U	350 U
Pyrene	µg/kg	41	2300000	370 U B	380 U B	360 U B	360 U B	340 U B	350 U B
SVOA-SIM (EPA 8270-SIM)									
Benzo(A)Pyrene	µg/kg	27	62	37 U B	38 U B	36 U B	36 U B	34 U B	35 U B
Bis(2-Chloroethyl)Ether	µg/kg	NE	210	37 U	38 U	36 U	36 U	34 U	35 U
Dibenzo(A,H)Anthracene	µg/kg	8	62	37 U B	38 U B	36 U B	36 U B	34 U B	35 U B
Hexachlorobenzene	µg/kg	NE	300	83 UJ	86 UJ	81 UJ	82 UJ	78 UJ	80 UJ
Indeno(1,2,3-Cd)Pyrene	µg/kg	21	620	16 J	40 U B	38 U B	38 U B	36 U B	37 U B
N-Nitroso-Di-N-Propylamine	µg/kg	NE	69	37 UJ	38 UJ	36 UJ	36 UJ	34 UJ	35 UJ
METALS (EPA 6010B/7471A)									
Aluminum	mg/kg	14800	76000	18300 J B	17000 B	12600	12100	7060	8740
Antimony	mg/kg	3.06	31	3.87 J B	2.75 J	3.03 J	4.91 J B	2.35 J	2.48 J
Arsenic	mg/kg	6.86	0.39	3.6 Y	8.7 B Y	26.1 B Y	35.8 B Y	1.48 Y	1.3 Y
Barium	mg/kg	173	5400	124	125	113	127	68.1	58.5
Beryllium	mg/kg	0.669	150	0.62	.591	.459	.485	.285	.327
Cadmium	mg/kg	2.35	37 <1.7>	0.554 U	.606	.916	.404 J	.521 U	.531 U
Calcium	mg/kg	46000	NE	7340	8280	7100	5290	3050	2480
Chromium	mg/kg	26.9	210	13.7 J	19.8	32 B	20.7	4.95	6.19
Cobalt	mg/kg	6.98	900	7.66 J B	7.19 B	5.75	5.91	3.7	4.27
Copper	mg/kg	10.5	3100	7.16	8.53	7.73	8.82	3.21	4.58
Iron	mg/kg	18400	23000	16500 J	15600	11800	11500	7180	8820
Lead	mg/kg	15.1	400 <150>	5.85 J	18.4 B	55.3 B	20.5 B	1.48	1.72
Magnesium	mg/kg	8370	NE	7260	6890	4830	4650	2990	3450
Manganese	mg/kg	291	1800	253	243	198	245	144	175
Mercury	mg/kg	0.22	NE	0.111 U	.114 U	.0633 J	.109 U	.104 U	.106 U
Molybdenum	mg/kg	NE	390	5.54 U	5.72 U	5.43 U	5.43 U	5.21 U	5.31 U
Nickel	mg/kg	15.3	1600	5.8	6.45	4.8	3.92	2.55	2.69
Potassium	mg/kg	4890	NE	4520	4200	3110	2940	1940	2680
Selenium	mg/kg	0.32	390	1.11 U B	1.14 U B	1.09 U B	1.09 U B	1.04 U B	1.06 U B
Silver	mg/kg	0.539	390	2.22 U B	2.29 U B	2.17 U B	2.17 U B	2.09 U B	2.13 U B
Sodium	mg/kg	405	NE	202	172	119	186	71.5 J	77.7 J
Thallium	mg/kg	0.42	5.2	1.11 U B	.38 U	1.09 U B	.574 U B	1.04 U B	1.06 U B
Vanadium	mg/kg	71.8	550	38.1	37.4	29.5	26.6	17.3	21
Zinc	mg/kg	77.9	23000	47.7 J	62.9	128 B	1380 B	21.1	25.5

Table 1
Analytical Results for Soil Samples — Former TAA130C, MCAS El Toro, California

[1] *Bechtel National, Inc., 1996, Draft Report Anthropogenic PAH Reference-Level Study, Marine Corps Air Station, El Toro, California, May.*
Bechtel National, Inc., 1996, Final Technical Memorandum Background and Reference Levels Remedial Investigations, Marine Corps Air Station, El Toro, California, October.
[2] *EPA Region IX, 2002, Preliminary Remedial Goals (PRG), October.*

B - result exceeds background
J - estimated value
M - modified
MCAS - Marine Corps Air Station
mg/kg - milligrams per kilogram
NE - not established
PRG - preliminary remedial goals
SIM - selected ion monitoring
TPH - total petroleum hydrocarbons
U - not detected at or above the stated reporting limit
UJ - estimated reporting limit
Y - result exceeds residential PRGs
µg/kg - micrograms per kilogram
< > - California Modified preliminary remedial goal

Table 2
Analytical Results for Field QC Sample — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3396 Equipment Rinsate 06/23/03
	Unit	
TPH (EPA 8015M)		
Diesel	mg/L	.094 U
Gasoline	mg/L	.1 U
PESTICIDES (EPA 8081A)		
4,4'-DDD	µg/L	.19 U
4,4'-DDE	µg/L	.19 U
4,4'-DDT	µg/L	.19 U
Aldrin	µg/L	.094 U
Alpha-BHC	µg/L	.094 U
Alpha-Chlordane	µg/L	.094 U
Beta-BHC	µg/L	.094 UJ
Delta-BHC	µg/L	.094 U
Dieldrin	µg/L	.19 U
Endosulfan I	µg/L	.094 U
Endosulfan II	µg/L	.19 U
Endosulfan Sulfate	µg/L	.19 U
Endrin	µg/L	.094 U
Endrin Aldehyde	µg/L	.19 U
Endrin Ketone	µg/L	.094 U
Gamma-BHC	µg/L	.094 U
Gamma-Chlordane	µg/L	.094 U
Heptachlor	µg/L	.094 U
Heptachlor Epoxide	µg/L	.094 U
Methoxychlor	µg/L	.94 U
Toxaphene	µg/L	2.8 U
VOLATILES (EPA 8260B)		
1,1,1-Trichloroethane	µg/L	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U
1,1,2-Trichloroethane	µg/L	5 U
1,1-Dichloroethane	µg/L	5 U
1,1-Dichloroethene	µg/L	5 U
1,2-Dichloroethane	µg/L	5 U
1,2-Dichloropropane	µg/L	5 U
2-Butanone	µg/L	50 U

Table 2
Analytical Results for Field QC Sample — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3396 Equipment Rinsate 06/23/03
	Unit	
2-Chloroethyl vinyl ether	µg/L	50 U
2-Hexanone	µg/L	50 U
4-Methyl-2-pentanone	µg/L	50 U
Acetone	µg/L	50 U
Benzene	µg/L	5 U
Bromodichloromethane	µg/L	5 U
Bromoform	µg/L	5 UJ
Bromomethane	µg/L	5 UJ
Carbon disulfide	µg/L	5 U
Carbon tetrachloride	µg/L	5 U
Chlorobenzene	µg/L	5 U
Chloroethane	µg/L	5 U
Chloroform	µg/L	5 U
Chloromethane	µg/L	5 U
Cis-1,2-Dichloroethene	µg/L	5 U
Cis-1,3-Dichloropropene	µg/L	5 U
Dibromochloromethane	µg/L	5 U
Ethylbenzene	µg/L	5 U
Methyl tert-butyl ether	µg/L	10 U
Methylene chloride	µg/L	5 U
Styrene	µg/L	5 U
Tetrachloroethene	µg/L	5 U
Toluene	µg/L	5 U
Trans-1,2-Dichloroethene	µg/L	5 U
Trans-1,3-Dichloropropene	µg/L	5 U
Trichloroethene	µg/L	5 U
Vinyl acetate	µg/L	50 U
Vinyl chloride	µg/L	5 U
Xylene, (total)	µg/L	5 U
SEMI-VOLATILES (EPA 8270C)		
1,2,4-Trichlorobenzene	µg/L	9.5 U
1,2-Dichlorobenzene	µg/L	9.5 U
1,3-Dichlorobenzene	µg/L	9.5 U
1,4-Dichlorobenzene	µg/L	9.5 U

Table 2
Analytical Results for Field QC Sample — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3396 Equipment Rinsate 06/23/03
	Unit	
2,4,5-Trichlorophenol	µg/L	24 U
2,4,6-Trichlorophenol	µg/L	9.5 U
2,4-Dichlorophenol	µg/L	9.5 U
2,4-Dimethylphenol	µg/L	9.5 U
2,4-Dinitrophenol	µg/L	24 U
2,4-Dinitrotoluene	µg/L	9.5 U
2,6-Dinitrotoluene	µg/L	9.5 U
2-Chloronaphthalene	µg/L	9.5 U
2-Chlorophenol	µg/L	9.5 U
2-Methylnaphthalene	µg/L	9.5 U
2-Methylphenol	µg/L	9.5 U
2-Nitroaniline	µg/L	24 U
2-Nitrophenol	µg/L	9.5 U
3,3'-Dichlorobenzidine	µg/L	9.5 U
3-Nitroaniline	µg/L	24 U
4,6-Dinitro-2-Methylphenol	µg/L	24 U
4-Bromophenyl Phenyl Ether	µg/L	9.5 U
4-Chloro-3-Methylphenol	µg/L	9.5 U
4-Chloroaniline	µg/L	9.5 U
4-Chlorophenyl Phenyl Ether	µg/L	9.5 U
4-Methylphenol	µg/L	9.5 U
4-Nitroaniline	µg/L	24 U
4-Nitrophenol	µg/L	24 U
Acenaphthene	µg/L	9.5 U
Acenaphthylene	µg/L	9.5 U
Anthracene	µg/L	9.5 U
Benzo(A)Anthracene	µg/L	9.5 U
Benzo(A)Pyrene	µg/L	9.5 U
Benzo(B)Fluoranthene	µg/L	9.5 U
Benzo(Ghi)Perylene	µg/L	9.5 U
Benzo(K)Fluoranthene	µg/L	9.5 U
Bis(2-Chloroethoxy)Methane	µg/L	9.5 U
Bis(2-Chloroethyl)Ether	µg/L	9.5 U
Bis(2-Chloroisopropyl)Ether	µg/L	9.5 U

Table 2
Analytical Results for Field QC Sample — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3396 Equipment Rinsate 06/23/03
	Unit	
Bis(2-Ethylhexyl)Phthalate	µg/L	19 U
Butyl Benzyl Phthalate	µg/L	9.5 U
Chrysene	µg/L	9.5 U
Di-N-Butyl Phthalate	µg/L	9.5 U
Di-N-Octyl Phthalate	µg/L	9.5 U
Dibenzo(A,H)Anthracene	µg/L	9.5 U
Dibenzoturan	µg/L	9.5 U
Diethyl Phthalate	µg/L	9.5 U
Dimethyl Phthalate	µg/L	9.5 U
Fluoranthene	µg/L	9.5 U
Fluorene	µg/L	9.5 U
Hexachlorobenzene	µg/L	9.5 U
Hexachlorobutadiene	µg/L	9.5 U
Hexachlorocyclopentadiene	µg/L	9.5 U
Hexachloroethane	µg/L	9.5 U
Indeno(1,2,3-Cd)Pyrene	µg/L	9.5 U
N-Nitroso-Di-N-Propylamine	µg/L	9.5 U
N-Nitrosodiphenylamine	µg/L	9.5 U
Naphthalene	µg/L	9.5 U
Nitrobenzene	µg/L	9.5 U
Pentachlorophenol	µg/L	9.5 U
Phenanthrene	µg/L	9.5 U
Phenol	µg/L	9.5 U
Pyrene	µg/L	9.5 U
METALS (EPA 6010B/7470A)		
Aluminum	µg/L	500 U
Antimony	µg/L	500 U
Arsenic	µg/L	5 U
Barium	µg/L	100 U
Beryllium	µg/L	10 U
Cadmium	µg/L	5 U
Calcium	µg/L	32.7 J
Chromium	µg/L	50 U
Cobalt	µg/L	50 U

Table 2
Analytical Results for Field QC Sample — Former TAA130C, MCAS El Toro, California

Sample Identification Location Code Date Sampled		818655-3396 Equipment Rinsate 06/23/03
	Unit	
Copper	µg/L	50 U
Iron	µg/L	1000 U
Lead	µg/L	5 U
Magnesium	µg/L	1000 U
Manganese	µg/L	20 U
Mercury	µg/L	.2 U
Molybdenum	µg/L	100 U
Nickel	µg/L	150 U
Potassium	µg/L	789 U
Selenium	µg/L	5 U
Silver	µg/L	50 U
Sodium	µg/L	92.8 J
Thallium	µg/L	10 U
Vanadium	µg/L	100 U
Zinc	µg/L	8.74 U

J - estimated value
MCAS - Marine Corps Air Station
mg/L - milligrams per liter
QC - quality control
TPH - total petroleum hydrocarbons
U - not detected at or above the stated reporting limit
UJ - estimated reporting limit
µg/L - micrograms per liter

Table 4-3
Summary of 1999 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification Location Code Date Sampled Depth (feet below ground surface)					20242-897 BLDG-493-HA01 06/08/99 1.0	20242-898 BLDG-493-HA02 06/08/99 1.0	20242-899 BLDG-493-HA03 06/08/99 1.0	20242-900 (Dup) BLDG-493-HA03 06/08/99 1.5	2024 BLDG-4 06/0 5
	Unit	Background	PRG Residential	PRG Industrial					
EPA 8081									
4,4'-DDD	mg/kg	0.0361	2.4	17	.019 J	.0046	.035	.11 B	.044
4,4'-DDE	mg/kg	0.145	1.7	12	.0099 J	.0059	.36 B	.845 B	.053
4,4'-DDT	mg/kg	0.236	1.7	12	.139 J	.04	.14	.512 B	.298
Aldrin	mg/kg	NE	0.029	0.15	.0011 UJ	.0011 U	.0054 U	.011 U	.0057
alpha-BHC	mg/kg	NE	0.09	0.59	.0011 UJ	.0011 U	.0054 U	.011 U	.0057
beta-BHC	mg/kg	NE	0.32	2.1	.0011 UJ	.0011 U	.0054 U	.011 U	.0057
Chlordane	mg/kg	NE	1.6	11	.057 UJ	.056 U	.27 U	.54 U	.28
Delta-BHC	mg/kg	NE	NE	NE	.0011 UJ	.0011 U	.0054 U	.011 U	.0057
Dieldrin	mg/kg	0.0199	0.03	0.15	.001 J	.0005 J	.02 B	.03 B Y	.011
Endosulfan I	mg/kg	0.000179	370	5300	.0011 UJ B	.0011 U B	.01 B	.022 B	.0057
Endosulfan II	mg/kg	0.00222	370	5300	.0023 UJ B	.0023 U B	.011 U B	.022 U B	.011
Endosulfan sulfate	mg/kg	0.0031	NE	NE	.0057 UJ B	.0056 U B	.027 U B	.054 U B	.028
Endrin	mg/kg	0.00222	18	260	.0007 J	.0023 U B	.01 B	.051 B	.011
Endrin aldehyde	mg/kg	0.00222	NE	NE	.002 J	.001 J	.006 J B	.03 B	.011
Endrin ketone	mg/kg	NE	NE	NE	.0023 UJ	.0023 U	.011 U	.022 U	.011
gamma-BHC	mg/kg	NE	0.44	2.9	.0011 UJ	.0011 U	.0054 U	.011 U	.0057
Heptachlor	mg/kg	NE	0.11	0.55	.0011 UJ	.0011 U	.0054 U	.011 U	.002
Heptachlor epoxide	mg/kg	NE	0.053	0.27	.0011 UJ	.0011 U	.0054 U	.011 U	.0057
Methoxychlor	mg/kg	NE	310	4400	.002 J	.002 J	.013 J	.045 J	.057
Toxaphene	mg/kg	NE	0.44	2.2	.11 UJ	.11 U	.54 U Y	1.1 U Y	.57
EPA 8150									
2,4,5-T	µg/kg	NE	610000	88000000	11 U	11 U	11 U	11 U	11
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	11 U	11 U	11 U	11 U	11
2,4-D	µg/kg	NE	690000	12000000	11 UJ	11 U	11 U	11 U	30
2,4-DB	µg/kg	NE	490000	700000	11 U	11 U	11 U	11 U	11
Dalapon	µg/kg	NE	1800000	26000000	23 U	23 U	22 U	22 U	23
Dicamba	µg/kg	NE	1800000	26000000	11 U	11 U	11 U	11 U	11
Dichlorprop	µg/kg	NE	NE	NE	11 U	11 U	11 U	11 U	11
Dinoseb	µg/kg	NE	61000	880000	23 U	23 U	22 U	22 U	23
MCPA	mg/kg	NE	31	440	2.3 U	2.3 U	2.2 U	2.2 U	2.3
MCPP	mg/kg	NE	61	880	2.3 U	2.3 U	2.2 U	2.2 U	2.3

Table 4-3
Summary of 1999 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification					42-876	20242-878	20242-879	20242-882	20242-883 (Dup)
Location Code					493-PB01	BLDG-493-PB01	BLDG-493-PB01	BLDG-493-PB01	BLDG-493-PB01
Date Sampled					07/99	06/07/99	06/07/99	06/07/99	06/07/99
Depth (feet below ground surface)					1.0	10.0	15.0	30.0	30.5
	Unit	Background	PRG Residential	PRG Industrial					
EPA 8081									
4,4'-DDD	mg/kg	0.0361	2.4	17	B	.0024 U	.0024 U	.0023 U	.0024 U
4,4'-DDE	mg/kg	0.145	1.7	12		.0024 U	.0024 U	.0023 U	.0024 U
4,4'-DDT	mg/kg	0.236	1.7	12	B	.0024 U	.0024 U	.0023 U	.0024 U
Aldrin	mg/kg	NE	0.029	0.15	U	.0012 U	.0012 U	.0012 U	.0012 U
alpha-BHC	mg/kg	NE	0.09	0.59	U	.0012 U	.0012 U	.0012 U	.0012 U
beta-BHC	mg/kg	NE	0.32	2.1	U	.0012 U	.0012 U	.0012 U	.0012 U
Chlordane	mg/kg	NE	1.6	11	U	.06 U	.061 U	.058 U	.059 U
Delta-BHC	mg/kg	NE	NE	NE	U	.0012 U	.0012 U	.0012 U	.0012 U
Dieldrin	mg/kg	0.0199	0.03	0.15	U	.0024 U	.0024 U	.0023 U	.0024 U
Endosulfan I	mg/kg	0.000179	370	5300	U B	.0012 U B	.0012 U B	.0012 U B	.0012 U B
Endosulfan II	mg/kg	0.00222	370	5300	U B	.0024 U B	.0024 U B	.0023 U B	.0024 U B
Endosulfan sulfate	mg/kg	0.0031	NE	NE	U B	.006 U B	.0061 U B	.0058 U B	.0059 U B
Endrin	mg/kg	0.00222	18	260	U B	.0024 U B	.0024 U B	.0023 U B	.0024 U B
Endrin aldehyde	mg/kg	0.00222	NE	NE	U B	.0024 UJ B	.0024 U B	.0023 U B	.0024 U B
Endrin ketone	mg/kg	NE	NE	NE	U	.0024 U	.0024 U	.0023 U	.0024 U
gamma-BHC	mg/kg	NE	0.44	2.9	U	.0012 U	.0012 U	.0012 U	.0012 U
Heptachlor	mg/kg	NE	0.11	0.55	J	.0012 U	.0012 U	.0012 U	.0012 U
Heptachlor epoxide	mg/kg	NE	0.053	0.27	U	.0012 U	.0012 U	.0012 U	.0012 U
Methoxychlor	mg/kg	NE	310	4400	U	.003 J	.012 U	.012 U	.012 U
Toxaphene	mg/kg	NE	0.44	2.2	U Y	.12 U	.12 U	.12 U	.12 U
EPA 8150									
2,4,5-T	µg/kg	NE	610000	88000000	U	12 U	12 U	12 U	12 U
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	U	12 U	12 U	12 U	12 U
2,4-D	µg/kg	NE	690000	12000000		12 U	12 U	12 U	12 U
2,4-DB	µg/kg	NE	490000	700000	U	12 U	12 U	12 U	12 U
Dalapon	µg/kg	NE	1800000	26000000	U	24 U	24 U	23 U	24 U
Dicamba	µg/kg	NE	1800000	26000000	U	12 U	12 U	12 U	12 U
Dichlorprop	µg/kg	NE	NE	NE	U	12 U	12 U	12 U	12 U
Dinoseb	µg/kg	NE	61000	880000	U	24 U	24 U	23 U	24 U
MCPA	mg/kg	NE	31	440	U	2.4 U	2.4 U	2.3 U	2.4 U
MCPP	mg/kg	NE	61	880	U	2.4 U	2.4 U	2.3 U	2.4 U

Table 4-3
Summary of 1999 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification / Location Code / Date Sampled / Depth (feet below ground surface)	Unit	Background	PRG Residential	PRG Industrial	20242-884 BLDG-493-PB02 06/07/99 5.0	20242-886 BLDG-493-PB02 06/07/99 15.0	20242-887 (Dup) BLDG-493-PB02 06/07/99 15.5	20242-890 BLDG-493-PB02 06/07/99 30.0	2024 BLDG- 06/
EPA 8081									
4,4'-DDD	mg/kg	0.0361	2.4	17	.0023 U	.0021 U	.0022 U	.0023 U	.26
4,4'-DDE	mg/kg	0.145	1.7	12	.0007 J	.0021 U	.0022 U	.0023 U	.24
4,4'-DDT	mg/kg	0.236	1.7	12	.0023 U	.0021 U	.0022 U	.0023 U	1.57
Aldrin	mg/kg	NE	0.029	0.15	.0012 U	.0011 U	.0011 U	.0011 U	.023
alpha-BHC	mg/kg	NE	0.09	0.59	.0012 U	.0011 U	.0011 U	.0011 U	.023
beta-BHC	mg/kg	NE	0.32	2.1	.0012 U	.0011 U	.0011 U	.0011 U	.023
Chlordane	mg/kg	NE	1.6	11	.058 U	.053 U	.055 U	.057 U	1.1
Delta-BHC	mg/kg	NE	NE	NE	.0012 U	.0011 U	.0011 U	.0011 U	.023
Dieldrin	mg/kg	0.0199	0.03	0.15	.0023 U	.0021 U	.0022 U	.0023 U	.046
Endosulfan I	mg/kg	0.000179	370	5300	.0012 U B	.0011 U B	.0011 U B	.0011 U B	.023
Endosulfan II	mg/kg	0.00222	370	5300	.0023 U B	.0021 U	.0022 U	.0023 U B	.046
Endosulfan sulfate	mg/kg	0.0031	NE	NE	.0058 U B	.0053 U B	.0055 U B	.0057 U B	.11
Endrin	mg/kg	0.00222	18	260	.0023 U B	.0021 U	.0022 U	.0023 U B	.046
Endrin aldehyde	mg/kg	0.00222	NE	NE	.0023 U B	.0021 U	.0022 U	.0023 U B	.046
Endrin ketone	mg/kg	NE	NE	NE	.0023 U	.0021 U	.0022 U	.0023 U	.046
gamma-BHC	mg/kg	NE	0.44	2.9	.0012 U	.0011 U	.0011 U	.0011 U	.023
Heptachlor	mg/kg	NE	0.11	0.55	.0012 U	.0011 U	.0011 U	.0011 U	.023
Heptachlor epoxide	mg/kg	NE	0.053	0.27	.0012 U	.0011 U	.0011 U	.0011 U	.023
Methoxychlor	mg/kg	NE	310	4400	.012 U	.011 U	.011 U	.011 U	.23
Toxaphene	mg/kg	NE	0.44	2.2	.12 U	.11 U	.11 U	.11 U	2.3
EPA 8150									
2,4,5-T	µg/kg	NE	610000	88000000	12 U	11 U	11 U	11 U	11
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	12 U	11 U	11 U	11 U	11
2,4-D	µg/kg	NE	690000	12000000	12 U	11 U	11 U	11 U	11
2,4-DB	µg/kg	NE	490000	700000	12 U	11 U	11 U	11 U	11
Dalapon	µg/kg	NE	1800000	26000000	23 U	21 U	22 U	23 U	23
Dicamba	µg/kg	NE	1800000	26000000	12 U	11 U	11 U	11 U	11
Dichlorprop	µg/kg	NE	NE	NE	12 U	11 U	11 U	11 U	11
Dinoseb	µg/kg	NE	61000	880000	23 U	21 U	22 U	23 U	23
MCPA	mg/kg	NE	31	440	2.3 U	2.1 U	2.2 U	2.3 U	2.3
MCPP	mg/kg	NE	61	880	2.3 U	2.1 U	2.2 U	2.3 U	2.3

Table 4-3
Summary of 1999 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification					42-891		20242-892		20242-893		20242-896	
Location Code					493-PB03		BLDG-493-PB03		BLDG-493-PB03		BLDG-493-PB03	
Date Sampled					07/99		06/07/99		06/07/99		06/07/99	
Depth (feet below ground surface)					5.0		10.0		15.0		30.0	
	Unit	Background	PRG Residential	PRG Industrial								
EPA 8081												
4,4'-DDD	mg/kg	0.0361	2.4	17		B	.0022	U	.0023	U	.0023	U
4,4'-DDE	mg/kg	0.145	1.7	12		B	.0022	U	.0023	U	.0023	U
4,4'-DDT	mg/kg	0.236	1.7	12		B	.0022	U	.0023	U	.0023	U
Aldrin	mg/kg	NE	0.029	0.15	U		.0011	U	.0011	U	.0012	U
alpha-BHC	mg/kg	NE	0.09	0.59	U		.0011	U	.0011	U	.0012	U
beta-BHC	mg/kg	NE	0.32	2.1	U		.0011	U	.0011	U	.0012	U
Chlordane	mg/kg	NE	1.6	11	U		.055	U	.057	U	.058	U
Delta-BHC	mg/kg	NE	NE	NE	U		.0011	U	.0011	U	.0012	U
Dieldrin	mg/kg	0.0199	0.03	0.15	U	B Y	.0022	U	.0023	U	.0023	U
Endosulfan I	mg/kg	0.000179	370	5300	U	B	.0011	U B	.0011	U B	.0012	U B
Endosulfan II	mg/kg	0.00222	370	5300	U	B	.0022	U	.0023	U B	.0023	U B
Endosulfan sulfate	mg/kg	0.0031	NE	NE	U	B	.0055	U B	.0057	U B	.0058	U B
Endrin	mg/kg	0.00222	18	260	U	B	.0022	U	.0023	U B	.0023	U B
Endrin aldehyde	mg/kg	0.00222	NE	NE	U	B	.0022	UJ	.0023	U B	.0023	U B
Endrin ketone	mg/kg	NE	NE	NE	U		.0022	U	.0023	U	.0023	U
gamma-BHC	mg/kg	NE	0.44	2.9	U		.0011	U	.0011	U	.0012	U
Heptachlor	mg/kg	NE	0.11	0.55	U		.0011	U	.0011	U	.0012	U
Heptachlor epoxide	mg/kg	NE	0.053	0.27	U		.0011	U	.0011	U	.0012	U
Methoxychlor	mg/kg	NE	310	4400	U		.003	J	.011	U	.012	U
Toxaphene	mg/kg	NE	0.44	2.2	U	Y X	.11	U	.11	U	.12	U
EPA 8150												
2,4,5-T	µg/kg	NE	610000	88000000	U		11	U	11	U	12	U
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	U		11	U	11	U	12	U
2,4-D	µg/kg	NE	690000	12000000	U		11	U	11	U	12	U
2,4-DB	µg/kg	NE	490000	700000	U		11	U	11	U	12	U
Dalapon	µg/kg	NE	1800000	26000000	U		22	U	23	U	23	U
Dicamba	µg/kg	NE	1800000	26000000	U		11	U	11	U	12	U
Dichlorprop	µg/kg	NE	NE	NE	U		11	U	11	U	12	U
Dinoseb	µg/kg	NE	61000	880000	U		22	U	23	U	23	U
MCPA	mg/kg	NE	31	440	U		2.2	U	2.3	U	2.3	U
MCPP	mg/kg	NE	61	880	U		2.2	U	2.3	U	2.3	U

Table 4-3
Summary of 1999 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

B - result exceeds established background limits
EPA - United States Environmental Protection Agency
HA - hand auger
J - estimated
MDL - method detection limit
NE - not established
OHM - OHM Remediation Services Corp.
PB - pesticide borings
PRG - Preliminary Remediation Goal, EPA Region IX, October 1999
RL - reporting limit
U - not detected above or equal to the stated reporting limit
UJ - not detected above or equal to the stated reporting limit. The sample detection limit is an estimated value.
ug/kg - micrograms per kilograms
X - result exceeds industrial PRGs
Y - result exceeds residential PRGs
** If the analyte had been detected bewteen the MDL and RL the actual value would have been reported and flagged with a "J" qualifier. For the samples in question, the laboratory did not detect analyte concentrations between the MDL and the RL. As a result, the samples are qualified as non-detect ("U").*

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification Location Code Date Sampled Depth (feet below ground surface)					20242-1138 BLDG-493-HA04 09/20/00 1.0	20242-1139 BLDG-493-HA04 09/20/00 3.0	20242-1140 BLDG-493-HA04 09/20/00 5.0	20242-1141 BLDG-493-HA04 09/20/00 7.0
	Unit	Background	PRG Residential	PRG Industrial				
EPA 8081/8082								
4,4'-DDD	mg/kg	0.0361	2.4	17	18 J B Y X	.05 U B	.051 U B	.051 U B
4,4'-DDE	mg/kg	0.145	1.7	12	3.3 J B Y	.03 U	.03 U	.03 U
4,4'-DDT	mg/kg	0.236	1.7	12	27 J B Y X	.043 U	.043 U	.044 U
Aldrin	mg/kg	NE	0.029	0.15	0.023 J	.026 U	.027 U	.027 U
alpha-BHC	mg/kg	NE	0.09	0.59	0.21 U Y	.022 U	.023 U	.023 U
alpha-Chlordane	mg/kg	0.00224	1.6	11	0.15 J B	.018 U B	.018 U B	.018 U B
beta-BHC	mg/kg	NE	0.32	2.1	0.37 U Y	.039 U	.04 U	.04 U
Delta-BHC	mg/kg	NE	NE	NE	0.12 U	.013 U	.013 U	.013 U
Dieldrin	mg/kg	0.0199	0.03	0.15	0.06 J B Y	.041 U B Y	.042 U B Y	.042 U B Y
Endosulfan I	mg/kg	0.000179	370	5300	0.14 J B	.025 U B	.025 U B	.025 U B
Endosulfan II	mg/kg	0.00222	370	5300	0.27 U B	.028 U B	.029 U B	.029 U B
Endosulfan sulfate	mg/kg	0.0031	NE	NE	0.4 U B	.043 U B	.043 U B	.044 U B
Endrin	mg/kg	0.00222	18	260	0.4 U B	.043 U B	.043 U B	.044 U B
Endrin aldehyde	mg/kg	0.00222	NE	NE	0.033 J B	.019 U B	.019 U B	.019 U B
gamma-BHC	mg/kg	NE	0.44	2.9	0.22 U	.024 U	.024 U	.024 U
gamma-Chlordane	mg/kg	0.0027	1.6	11	12 U B Y X	.018 U B	.018 U B	.018 U B
Heptachlor	mg/kg	NE	0.11	0.55	0.21 J Y	.024 U	.024 U	.024 U
Heptachlor epoxide	mg/kg	NE	0.053	0.27	0.23 U Y	.025 U	.025 U	.025 U
Methoxychlor	mg/kg	NE	310	4400	0.63 U	.067 U	.069 U	.069 U
Toxaphene	mg/kg	NE	0.44	2.2	0.16 U	.83 U Y	.85 U Y	.85 U Y
Dicofol	mg/kg	NE	1.1	5.6	.39	.0098 U	.01 U	.01 U
EPA 8141								
Diazinon	µg/kg	NE	55000	790000	1100 UJ	120 UJ	120 UJ	120 UJ
Malathion	µg/kg	NE	1200000	18000000	1100 U	10 J	120 U	120 U
EPA 8151								
2,4,5-T	µg/kg	NE	610000	88000000	110 U	120 U	120 U	120 U
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	110 U	120 U	120 U	120 U
2,4-D	µg/kg	NE	690000	12000000	53	12 U	12 U	12 U
2,4-DB	µg/kg	NE	490000	700000	11 U	12 U	12 U	12 U
Dalapon	µg/kg	NE	1800000	26000000	4400 U	4700 U	4800 U	4800 U
Dicamba	µg/kg	NE	1800000	26000000	220 U	240 U	240 U	240 U
Dichlorprop	µg/kg	NE	NE	NE	550 U	590 U	600 U	600 U

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification Location Code Date Sampled Depth (feet below ground surface)					20242-1138 BLDG-493-HA04 09/20/00 1.0	20242-1139 BLDG-493-HA04 09/20/00 3.0	20242-1140 BLDG-493-HA04 09/20/00 5.0	20242-1141 BLDG-493-HA04 09/20/00 7.0
	Unit	Background	PRG Residential	PRG Industrial				
Dinoseb	µg/kg	NE	61000	880000	55 U	59 U	60 U	60 U
MCPA	mg/kg	NE	31	440	1.1 U	1.2 U	1.2 U	1.2 U
MCPP	mg/kg	NE	61	880	1.1 U	1.2 U	1.2 U	1.2 U
EPA 8270								
Strychnine	µg/kg	NE	18000	260000	15000 U	790 UJ	810 U	810 U

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification Location Code Date Sampled Depth (feet below ground surface)					20242-1142 BLDG-493-HA04 09/20/00 9.0	20242-1143 BLDG-493-HA05 09/20/00 1.0	20242-1144 BLDG-493-HA05 09/20/00 3.0	20242-1145 BLDG-493-HA05 09/20/00 5.0
	Unit	Background	PRG Residential	PRG Industrial				
EPA 8081/8082								
4,4'-DDD	mg/kg	0.0361	2.4	17	.055 U B	.23 U B	0.44 J B	.047 U B
4,4'-DDE	mg/kg	0.145	1.7	12	.033 U	.024 J	.18 J B	.028 U
4,4'-DDT	mg/kg	0.236	1.7	12	.047 U	.1 J	2 B Y	.04 U
Aldrin	mg/kg	NE	0.029	0.15	.029 U Y	.12 U Y	0.5 U Y X	.025 U
alpha-BHC	mg/kg	NE	0.09	0.59	.025 U	.11 U Y	0.43 U Y X	.021 U
alpha-Chlordane	mg/kg	0.00224	1.6	11	.02 U B	.083 U B	0.34 U B	.017 U B
beta-BHC	mg/kg	NE	0.32	2.1	.043 U	.18 U	0.75 U Y	.037 U
Delta-BHC	mg/kg	NE	NE	NE	.014 U	.061 U	0.25 U	.012 U
Dieldrin	mg/kg	0.0199	0.03	0.15	.046 U B Y	.19 U B Y X	0.79 U B Y X	.039 U B Y
Endosulfan I	mg/kg	0.000179	370	5300	.027 U B	.12 U B	0.48 U B	.024 U B
Endosulfan II	mg/kg	0.00222	370	5300	.031 U B	.13 U B	0.54 U B	.027 U B
Endosulfan sulfate	mg/kg	0.0031	NE	NE	.047 U B	.2 U B	0.82 U B	.04 U B
Endrin	mg/kg	0.00222	18	260	.047 U B	.2 U B	0.014 J B	.04 U B
Endrin aldehyde	mg/kg	0.00222	NE	NE	.021 U B	.089 U B	0.36 U B	.018 U B
gamma-BHC	mg/kg	NE	0.44	2.9	.026 U	.11 U	0.45 U Y	.022 U
gamma-Chlordane	mg/kg	0.0027	1.6	11	.02 U B	.0045 J B	0.34 U B	.017 U B
Heptachlor	mg/kg	NE	0.11	0.55	.026 U	.11 U Y	0.45 U Y X	.022 U
Heptachlor epoxide	mg/kg	NE	0.053	0.27	.027 U	.12 U Y	0.48 U Y X	.024 U
Methoxychlor	mg/kg	NE	310	4400	.075 U	.32 U	1.3 U	.064 U
Toxaphene	mg/kg	NE	0.44	2.2	.92 U Y	3.9 U Y X	16 U Y X	.79 U Y
Dicofol	mg/kg	NE	1.1	5.6	.011 U	.0025 J	.032	.0093 U
EPA 8141								
Diazinon	µg/kg	NE	55000	790000	130 UJ	110 UJ	110 UJ	110 UJ
Malathion	µg/kg	NE	1200000	18000000	130 U	110 U	110 U	110 U
EPA 8151								
2,4,5-T	µg/kg	NE	610000	88000000	130 U	110 U	110 U	110 U
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	130 U	110 U	110 U	110 U
2,4-D	µg/kg	NE	690000	12000000	13 U	11 U	11 U	6.1 J
2,4-DB	µg/kg	NE	490000	700000	13 U	11 U	11 U	11 U
Dalapon	µg/kg	NE	1800000	26000000	5200 U	4400 U	4500 U	4500 U
Dicamba	µg/kg	NE	1800000	26000000	260 U	220 U	230 U	220 U
Dichlorprop	µg/kg	NE	NE	NE	650 U	560 U	570 U	560 U

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification					20242-1142	20242-1143	20242-1144	20242-1145
Location Code					BLDG-493-HA04	BLDG-493-HA05	BLDG-493-HA05	BLDG-493-HA05
Date Sampled					09/20/00	09/20/00	09/20/00	09/20/00
Depth (feet below ground surface)					9.0	1.0	3.0	5.0
	Unit	Background	PRG Residential	PRG Industrial				
Dinoseb	µg/kg	NE	61000	880000	65 U Y	56 U	57 U	56 U
MCPA	mg/kg	NE	31	440	1300 U	1.1 U	1.1 U	1.1 U
MCPP	mg/kg	NE	61	880	1300 U	1.1 U	1.1 U	1.1 U
EPA 8270								
Strychnine	µg/kg	NE	18000	260000	880 U	1500 U	760 U	750 U

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification Location Code Date Sampled Depth (feet below ground surface)					20242-1146 BLDG-493-HA05 09/20/00 7.0	20242-1147 BLDG-493-HA05 09/20/00 9.0
	Unit	Background	PRG Residential	PRG Industrial		
EPA 8081/8082						
4,4'-DDD	mg/kg	0.0361	2.4	17	.053 U B	.054 U B
4,4'-DDE	mg/kg	0.145	1.7	12	.031 U	.012 J
4,4'-DDT	mg/kg	0.236	1.7	12	.045 U	.02 J
Aldrin	mg/kg	NE	0.029	0.15	.028 U	.028 U
alpha-BHC	mg/kg	NE	0.09	0.59	.024 U	.024 U
alpha-Chlordane	mg/kg	0.00224	1.6	11	.019 U B	.019 U B
beta-BHC	mg/kg	NE	0.32	2.1	.041 U	.042 U
Delta-BHC	mg/kg	NE	NE	NE	.014 U	.014 U
Dieldrin	mg/kg	0.0199	0.03	0.15	.044 U B Y	.045 U B Y
Endosulfan I	mg/kg	0.000179	370	5300	.026 U B	.027 U B
Endosulfan II	mg/kg	0.00222	370	5300	.03 U B	.031 U B
Endosulfan sulfate	mg/kg	0.0031	NE	NE	.045 U B	.046 U B
Endrin	mg/kg	0.00222	18	260	.045 U B	.046 U B
Endrin aldehyde	mg/kg	0.00222	NE	NE	.02 U B	.02 U B
gamma-BHC	mg/kg	NE	0.44	2.9	.025 U	.026 U
gamma-Chlordane	mg/kg	0.0027	1.6	11	.019 U B	.00093 J
Heptachlor	mg/kg	NE	0.11	0.55	.025 U	.026 U
Heptachlor epoxide	mg/kg	NE	0.053	0.27	.026 U	.027 U
Methoxychlor	mg/kg	NE	310	4400	.072 U	.073 U
Toxaphene	mg/kg	NE	0.44	2.2	.88 U Y	.89 U Y
Dicofol	mg/kg	NE	1.1	5.6	.01 U	.011 U
EPA 8141						
Diazinon	µg/kg	NE	55000	790000	130 UJ	130 UJ
Malathion	µg/kg	NE	1200000	18000000	130 U	130 U
EPA 8151						
2,4,5-T	µg/kg	NE	610000	88000000	130 U	130 U
2,4,5-TP (Silvex)	µg/kg	NE	490000	7000000	130 U	130 U
2,4-D	µg/kg	NE	690000	12000000	13 U	13 U
2,4-DB	µg/kg	NE	490000	700000	13 U	13 U
Dalapon	µg/kg	NE	1800000	26000000	5000 U	5100 U
Dicamba	µg/kg	NE	1800000	26000000	250 U	260 U
Dichlorprop	µg/kg	NE	NE	NE	630 U	640 U

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

Sample Identification					20242-1146	20242-1147
Location Code					BLDG-493-HA05	BLDG-493-HA05
Date Sampled					09/20/00	09/20/00
Depth (feet below ground surface)					7.0	9.0
	Unit	Background	PRG Residential	PRG Industrial		
Dinoseb	µg/kg	NE	61000	880000	63 U Y	64 U Y
MCPA	mg/kg	NE	31	440	1.3 U	1.3 U
MCPP	mg/kg	NE	61	880	1.3 U	1.3 U
EPA 8270						
Strychnine	µg/kg	NE	18000	260000	840 U	850 U

Table 4-4
Summary of 2000 Analytical Results for Soil Samples — Pesticide Storage Area (Bldg. 493) - MSC P1

B - result exceeds established background limits
EPA - United States Environmental Protection Agency
J - estimated
M - Modified
MDL - method detection limit
mg/kg - milligrams per kilogram
NA - not analyzed
NE - not established
OHM - OHM Remediation Services Corp.
PRG - Preliminary Remediation Goal, EPA Region IX, October 1999
RL - reporting limit
U - not detected above or equal to the stated reporting limit. If the analyte had been detected bewteen the MDL and RL the actual value would have been reported and flagged with a "J" qualifier. For the samples in question, the laboratory did not detect analyte concentrations between the MDL and the RL. As a result, the samples are qualified as non-detect ("U").
µg/kg - micrograms per kilogram
UJ - the sample detection limit is an estimated value
X - result exceeds industrial PRGs
Y - result exceeds residential PRGs

APPENDIX A
DRAFT SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)

CLOSURE OF TEMPORARY ACCUMULATION AREAS 771, 130C AND MSC P1
UNIT 2, BUILDING 493

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

August 2004

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APPENDIX A

DRAFT SAMPLING AND ANALYSIS PLAN

CLOSURE OF INACTIVE TEMPORARY ACCUMULATION AREAS 771, 130C, AND MSC P1 UNIT 2, BUILDING 493

FORMER MARINE CORPS AIR STATION EL TORO, CALIFORNIA

Contract Number N68711-04-R-1010

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LIST OF ACRONYMS

ASTM D	American Society for Testing and Materials Designation
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
°C	degrees Celsius
CCC	calibration check compound
CF	calibration factor
CIH	Certified Industrial Hygienist
COC	chain-of-custody
DHS	California Department of Health Services
DOT	Department of Transportation
DQIs	data quality indicators
DQOs	data quality objectives
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
HAZMAT	hazardous materials
HCl	hydrochloric acid
IDW	investigation-derived waste
LCS	laboratory control sample
LIMS	laboratory information management system
LQMP	Laboratory Quality Management Plan
LUFT	leaking underground fuel tank
MCAS	Marine Corps Air Station
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MD	matrix duplicate
MDLs	method detection limits

LIST OF ACRONYMS (CONT.)

MS	matrix spike
MSD	matrix spike duplicate
MRLs	method reporting limits
NEDTS	Navy Environmental Data Transfer Standard
NFESC	Naval Facilities Engineering Service Center
PARCCS	precision, accuracy, representativeness, comparability, completeness and sensitivity
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
ppmv	parts per million by volume
PE	performance evaluation
PPE	personal protective equipment
PRG	preliminary remediation goal
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QCR	quality control report
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RPM	remedial project manager
RSD	relative standard deviation
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SHSP	Site Health and Safety Plan
SOPs	standard operating procedures
SPCC	system performance check compound
STLC	Soluble Threshold Limit Concentration

LIST OF ACRONYMS (CONT.)

SVOCs	semi-volatile organic compounds
TAA	Temporary Accumulation Area
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TPH-g	total petroleum hydrocarbons quantified as gasoline
TSA	technical systems audit
TTLC	Total Threshold Limit Concentration
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
VOA	volatile organic analysis
VOCs	volatile organic compounds

1.0 INTRODUCTION

RMA LAND CONSTRUCTION, Inc. (RMA) has prepared this Sampling and Analysis Plan (SAP) to be implemented during field activities at the following sites located at the former Marine Corps Air Station (MCAS) El Toro, California (the Station).

- Former Temporary Accumulation Areas (TAAs) 771 and 130C.
- Miscellaneous Sites of Concern (MSC) Pesticide Storage Area 1 (MSC P1) Unit 2 Building 493.

This SAP is a combination of a field sampling plan (FSP) and a quality assurance project plan (QAPP). This SAP outlines the data quality objectives (DQOs), sampling strategies, and procedures for performing field activities at these sites.

The field activities at the former TAAs 771, 130C and MSC P1 Unit 2 Building 493 will include excavation of contaminated soils, collection of confirmation soil samples, management of excavated soil, documenting sample information, decontaminating equipment, managing investigation-derived waste (IDW), submitting samples to a chemical laboratory for analysis, and ensuring that quality assurance (QA) and quality control (QC) requirements are met.

This SAP is based on the requirements of the following documents:

- *Guidance for the Data Quality Objectives Process*, U.S. Environmental Protection Agency (EPA) QA/G-4 (EPA, 2000)
- *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5 (EPA, 2001)
- *Navy Installation Restoration Chemical Data Quality Manual* (Naval Facilities Engineering Services Center [NFESC], 1999)
- *Environmental Work Instruction* 3EN2.1-Chemical Data Validation (U.S. Navy Southwest Division, 2001a)
- *Environmental Work Instruction 3EN2.2-Review*, Approval, Revision, and Amendment of Sampling and Analysis Plans (U.S. Navy Southwest Division, 2001b)
- *Environmental Work Instruction 3EN2.3-Laboratory Quality Assurance Program* (U.S. Navy Southwest Division, 2001c)
- *Environmental Work Instruction 4EN-Environmental Data Management and Required Electronic Delivery System* (U.S. Navy Southwest Division, 2001d)

This SAP is a controlled document distributed by RMA to all members of the project team. It is required reading for all staff participating in the data collection method, and it will be in the possession of the field teams.

This SAP was prepared to ensure that the data collected over the course of the project are of known quality to meet their intended use and that all components of data acquisition are thoroughly documented, verifiable, and defensible. This document describes the project data quality objectives (DQOs) and, based on these DQOs, derives appropriate quality assurance (QA) objectives and quality control (QC) requirements to ensure that the acquired data are valid and usable. The SAP outlines the sampling strategy and design; establishes the field procedure requirements; and the criteria for data quality in terms of the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. The SAP complies with the EPA's requirements for QAPPs, QA/R-5, (EPA, 2001). The QAPP elements are categorized into four groups that are addressed in the SAP as follows:

Group A – Project Management

- Title and approval sheet
- Table of contents
- Project/task organization – Section 1.3
- Data quality objectives – Section 2.1
- Documentation and records – Section 3.0.

Group B – Measurement/Data Acquisition

- Sampling method requirements – Section 4.0
- Sample handling and custody requirements – Section 5.0
- Analytical method requirements – Section 6.2
- Quality control requirements – Section 7.0
- Instrument/equipment testing, inspection, and maintenance requirements – Section 8.0
- Instrument calibration and frequency – Section 9.0
- Acceptance requirements for supplies and consumables – Section 9.7

Group C – Assessment/Oversight

- Assessments and response actions – Section 10.1
- Reports to management – Section 10.2

Group D – Data Validation and Usability

- Data review, validation, and verification requirements – Section 11.1

- Validation and verification methods – Sections 11.2 and 11.3
- Reconciliation with user requirements – Section 11.4.

The California Department of Toxic Substances Control (DTSC) has regulatory oversight for the TAAs and MSC P1 sites.

1.1 Site Description and Background

Former MCAS El Toro is located in southern California approximately 45 miles southeast of Los Angeles in Orange County. The Station is approximately 1 mile north of the intersection of Interstates 5 and 405, and covers approximately 4,700 acres (Figure 1-1). Former TAAs, MSC P1 Unit 2, former UST sites and MSC JP5 inactive pipeline unit locations are shown in Figure 1-2. Detailed background information on Former TAAs 771, 130C and MSC P1 Unit 2, Building 493 is described in Section 2 of Work Plan.

1.2 Objectives

The objectives at the former TAA 771, 130C and MSC P1 Unit 2 sites are to remove very near surface and subsurface contaminated soils identified by previous investigations, perform confirmation soil sampling to verify removal of contaminated soils and obtain regulatory closure of these sites.

This SAP is intended for use as a reference by field personnel during field sampling activities.

The SAP has the following objectives:

- Describe and establish consistent field sampling procedures
- Establish data gathering, sample handling, and documentation methods that will be employed during field activities
- Ensure that the data collected over the course of the project are of known quality to meet their intended use
- Ensure that all components of data acquisition are thoroughly documented, are verifiable, and are defensible
- Describe the project data quality objectives (DQOs)
- Derive appropriate QA objectives and QC checks based on these DQOs
- Outline the criteria for data quality in terms of precision, accuracy, representativeness, comparability, completeness and sensitivity, often referred to as the PARCCS parameters

The SAP is designed to satisfy the data collection requirements of Navy personnel who will review and approve this SAP.

1.3 Project Organization

This section presents the specific roles, activities and responsibilities of RMA personnel, as well as the internal lines of communication within and between RMA and the Navy. Table 1-1 outlines key personnel and their responsibilities. The project organization chart is presented as Figure 1-3.

2.0 PROJECT QUALITY ASSURANCE OBJECTIVES

The project quality assurance objectives are expressed in terms of DQOs and measurement quality objectives. DQOs are qualitative and quantitative statements that clarify the project objectives; specify the most appropriate type of data for the project decisions; determine the most appropriate conditions from which to collect data; and specify tolerable limits on decision errors. Measurement quality objectives are acceptance criteria or ranges for systematic QC checks that will be incorporated into the sampling and analyses to show that procedures and test results remain reproducible and that the analytical method is actually measuring the quantity of target analytes without unacceptable bias.

2.1 Data Quality Objectives (DQOs) Process

To generate data that will meet project-specific requirements, it will be necessary to define the types of decisions that will be made and to identify the purpose of the data. DQOs define data quality requirements based on the intended use of the data. Project-specific DQOs were established to encompass both field and laboratory operations. The project DQOs have been developed in accordance with the USEPA seven-step DQO process as described in QA/G-4 (USEPA, 2000). The seven-step DQO process for the closure of inactive TAAs and MSC P1 Unit 2 Building 493 is presented in Attachment 1.

2.2 Measurement Quality Objectives

To ensure that quality data are continuously produced during analysis and allow the eventual compliance review, systematic QC checks will be incorporated into the sampling and analyses to show that procedures and test results remain reproducible and that the analytical method is actually measuring the quantity of target analytes without unacceptable bias. Systematic QC checks will include the scheduled analyses of field and laboratory replicates, standards, surrogates, spiked samples, and blanks as discussed in Section 7.0. Measurement quality objectives (acceptance criteria or ranges) for these systematic QC checks will be established to verify that data quality indicators (DQIs) support data usability and contract compliance. DQIs, formerly referred to as the PARCCS parameters of precision, accuracy, representativeness, comparability, completeness, and sensitivity, are defined in the following sub-sections.

2.2.1 Precision

Precision refers to the distribution of a set of reported values about the mean, or the closeness of agreement between individual test results obtained under prescribed conditions. Precision reflects the random error and may be affected by systematic error. Precision also characterizes the natural variation of the matrix and how the contamination exists or varies within that matrix. For chemical parameters that do not allow homogenization prior to sample acquisition (e.g., volatile organic analysis), precision values must be reviewed accordingly. In order to assess the effect that these variables have on the total precision of data, both field and laboratory replicates will be acquired for this project. In order to assess matrix heterogeneity or sample handling procedures, field precision will be determined from field duplicate samples or quality assurance split samples. For environmental samples, laboratory precision will be determined from laboratory duplicate samples (i.e., MS/MSD or MD samples). However, to establish the precision of a given analytical method without the effect of a matrix, an LCS is necessary. Precision is most often expressed in terms of relative percent difference (RPD) (relative range for duplicates).

The RPD for a set of duplicate measurements of a variable X is defined as:

$$\text{RPD} = \left(\frac{|X_1 - X_2|}{[(X_1 + X_2)/2]} \right) \times 100\%$$

2.2.2 Bias

Bias refers to the systematic or persistent distortion of a measurement process that causes errors in one direction (above or below the true value or mean). Bias may be affected by errors made in field or laboratory handling procedures. For example, procedural deviations in sample acquisition, incomplete homogenization prior to sub sampling, or incomplete extraction of contaminants from the matrix intensifies bias. Bias is a term that is related to but is not interchangeable with accuracy. Bias assessments will be based upon the analysis of spiked reference materials or spiked samples (i.e., LCS, MS, MSD, surrogates). When the sample matrix is spiked, the result allows an assessment of the effect of the sample matrix on recoveries. The sources of error contributing to the bias of a measurement can be difficult to determine for an entire sample collection/analysis activity. Sources of error may include the loss (or addition) of contaminants from the sampling and analysis process (i.e., sample handling, field cross-contamination, improper sample preservation, sample manipulation during preparation and analysis), interferences present within the sample matrix, and measurement error (i.e., calibration error or drift). Bias values for the LCS represent quantitative limits beyond which data are unacceptable.

Bias values are commonly expressed as percent recovery. Percent recovery (%R) is calculated as follows:

$$\%R = \left(\frac{|X_s - X_u|}{K} \right) \times 100\%$$

where

X_s = measured value of the spiked sample

X_u = measured value of the unspiked sample

K = known amount of the spike in the sample

When $\%R$ is calculated for the LCS or other reference materials, X_u could be set at zero. The relationship between percent bias ($\%B$) and percent recovery is as follows:

$$\%B = \%R - 100$$

2.2.3 Accuracy

Accuracy is the measure of the closeness of an observed value to the "true" value (e.g., theoretical or reference value, or population mean). Accuracy includes a combination of random error and systematic error (bias) components that result from sampling and analytical operations.

2.2.4 Representativeness

Representativeness refers to the degree to which sample data accurately and precisely describe the characteristics of a population of samples, parameter variations at a sampling point, or environmental condition. Samples that are not properly collected or preserved (e.g., contaminant loss or addition) or are analyzed beyond acceptable holding times shall not be considered to provide representative data. Representativeness is a parameter that is concerned primarily with the proper design of the sampling program or sub-sampling of a given sample. An assessment of representativeness will include an evaluation of precision. The representativeness criterion is best satisfied in the laboratory by making certain that all sub-samples taken from a given sample are representative of the sample as a whole. This shall include sample premixing/homogenizing prior to and during aliquotting procedures. Samples requiring volatile analysis shall not undergo any premixing or homogenization. Therefore, noting sample characteristics in a case narrative shall assist in the evaluation of data. Representativeness will be assessed by a review of the precision obtained from the field and laboratory duplicate samples. In this way, they provide both precision and representativeness information. Existing project data may be employed to assess the representativeness of a population by defining the continuity of data from point to point.

2.2.5 Comparability

Comparability is a qualitative objective of the data, expressing the confidence with which one data set can be compared with another. Sample data shall be comparable for similar samples and sample conditions. This goal is achieved through the use of standard techniques to collect representative samples, consistent application of analytical method protocols, and reporting analytical results with appropriate units.

2.2.6 Completeness

Completeness goals, if defined for individual sampling and analytical protocols, are normally combined to assess the expectations of the project as a whole. Completeness is the percentage of measurements that are judged to be usable (i.e., which meet project-specific requirements) compared to the total number of measurements planned. Those data that are validated and need

no qualification or are qualified as estimated are considered usable. Rejected data are not considered usable. Completeness will be calculated following data evaluation. For this project, a completeness goal of 90% is projected.

2.2.7 Sensitivity

The term sensitivity is used here to describe the project required reporting limits (PRRLs) established to meet project-specific DQOs. The PRRL is a threshold value below which the laboratory reports a result as non-detected (U), and shall be presented as "less than a concentration value" (< ##). PRRLs will be adjusted based on the sample matrix and any sample dilutions/concentrations necessary.

PRRLs that have been established are identified in Tables 2-1 to 2-5, Project Required Reporting Limits.

3.0 DOCUMENTS AND RECORDS

Documentation is critical for evaluating the success of any environmental data collection activity. This section outlines standard practices and procedures to be used when documenting field and laboratory activities and the requirements for preparing laboratory data packages. Applicable requirements are identified in the following sub-sections.

3.1 Field Documentation

All field documentation shall be properly completed with indelible ink as necessary to support the use of these records in any potential enforcement actions that may result. Corrections to documentation shall be made by placing a single line through the incorrect entry and noting the corrected information, recorder's initials, and the date the correction was performed. Following site activities, all project documentation shall become a part of the final evidence file. These records shall be maintained for a certain period of retention time.

3.1.1 Daily Contractor Quality Control Reports (QCR)

During the field investigation or remedial action activities, daily contractor QCRs shall be prepared, dated, signed by the project contractor quality control representative, and sent to the Navy. With respect to geotechnical and chemical procedures, these reports shall include weather information at the time of sampling, field instrument measurements, calibrations, identification of all field and control samples taken, departures from the approved SAP, deviations from approved geotechnical procedures (such as well installation or drilling), any problems encountered, and instructions from Navy personnel. Any deviations that may affect data quality objectives shall be conveyed to Navy personnel (remedial project manager, QA officer, technical representative, resident officer in charge of construction, etc.).

3.1.2 Field Logbooks

Field logbooks shall contain sufficient information to enable the sampling activity to be reconstructed without relying on the collector's memory. Project field logbooks shall be permanently bound and have consecutively numbered water-resistant pages. The site name and project name and number shall be recorded on the inside front cover of the logbook. All pertinent information regarding the site and sampling procedures shall be documented as near to real-time as possible. At the conclusion of each day, the person maintaining the logbook shall sign and date the day's documentation entries. Notations shall be made in logbook fashion, noting the time and date of all entries. Information recorded in other project documents shall not be repeated in the field logbook, except in summary form to avoid transcription errors. Logbooks

shall be kept in the field team member's possession or in a secure place during field work. Following site activities or if the logbook is completely filled, the logbook shall become a part of the project final evidence file as noted previously.

If it is necessary to transfer the logbook to another person during the course of field work, the person relinquishing the logbook will sign and date the logbook at the time it is transferred, and the person receiving the logbook will do likewise.

The following are some suggested topics to include in the field logbook:

- Name and exact location of site of investigation or interest.
- Name and title of person maintaining logbook (author).
- Date and time of arrival and departure at site location.
- Purpose of site visit or sampling activity.
- Name and address of field contact. This may also include information on access agreements.
- Names and responsibilities of all persons on site.
- Names, affiliations, and purpose of all site visitors.
- Level of personal protective equipment worn at the site.
- Weather conditions on the day of sampling, and any additional environmental conditions or observations pertinent to field activities.
- Field instrumentation or equipment used, and purpose of use (i.e., health and safety screening, sample selection for laboratory analysis). Note source, quality, or lot numbers for any supplies or reagents (e.g., sample containers, preservatives, reagents, water for field blanks/field control samples, and decontamination procedures). Retain any certificates or information supplied with the equipment used.
- Type of waste, suspected waste concentrations if known, and sample matrices to be handled.
- Document the sample collection method and any sample handling procedures such as filtration, compositing, and executed preservation techniques used.
- Document the sample location. If a compositing scheme is used, clearly identify appropriate locations for all sample aliquots included within each composite sample. Prepare a dimensional sketch of the general surroundings of the sampling area (site), and/or support with other forms of documentation (i.e., photographic log). Sample identification numbers should correspond directly with sample locations.

- Identify sample numbers, volumes, and containers (number, size, type) used for each sample collected. Note the date and time of each sample, identify any associated QC samples, or any factors that may affect the quality.
- Record any field measurements, field screening/analytical results generated, calibration methods used, field results, and QC information.
- Identify decontamination procedures employed for sampling equipment.
- Document appropriate references to maps and photographic logs of the sampling site.
- Record information on scheduling modifications, change orders, sampling or drilling decisions/changes.
- Describe the number of shipping coolers packed, note chain-of-custody (COC) numbers or attach a copy of COC, and record the mode of transportation and applicable tracking numbers.
- Record name and address of all receiving laboratories.
- Maintain appropriate documentation for investigative-derived wastes. Note contents and volumes of waste generated, storage, and disposal methods used.

3.1.3 Photographic Documentation

All sampling points shall be documented photographically. A record of a sampling event allows positive identification of the sampling point. Photographs are the most accurate and convenient record of field personnel observations. Photographs taken to document sampling points shall include two or more reference points to facilitate relocating the point at a later date. Keeping a record of photographs taken is crucial to their validity as a representation of an existing situation. Photographic documentation is invaluable if the sampling and subsequent analytical data end in litigation, enforcement, or cost recovery actions. For each photograph taken, the following items shall be noted in the field logbook:

- Date.
- Time.
- Photographer (signature).
- Name of site.
- General direction faced and description of the subject.
- Sequential number of the photograph and the roll number.
- Site photo map

4.0 FIELD METHODS AND SAMPLING PROCEDURES

This section describes the methods and procedures to be used during the soil, soil vapor and groundwater sampling with respect to sample locations, sample collection, sampling equipment decontamination, preservatives, holding times and sample containers. The sampling plan described in the following subsections has been designed in accordance with Chapter 9 of USEPA SW-846.

4.1 Sampling Strategy

Soil samples will be collected for the following sites as described below:

Former Inactive TAAs 771, 130C and MSC P1 Unit 2, Building 493: Confirmation soil samples will be collected from the bottom and wall of the excavations at each site.

In addition, aqueous samples of the decontamination water generated during excavation and confirmation soil sampling activities will be collected and analyzed for waste characterization and disposal purposes. Details of each type of sampling are provided in the following subsections.

4.2 Sampling Locations

This section describes the number and locations of samples that will be collected at TAAs 771, 130C and MSC P1 Unit 2, Building 493.

4.2.1 Confirmation Soil Sampling Locations for TAAs and MSC P1 Unit 2 Site

Confirmation soil samples will be collected from the excavations after removal of contaminated soils at former inactive TAAs 771, 130C and MSC P1 Unit 2 Building 493. Because of the nature of the sampling methodology (judgmental, based on visual inspection of the site after excavation), the exact location of the samples cannot be specified at this time. At a minimum one soil sample per each side wall of the excavation will be collected at the mid point and one bottom floor soil sample will be collected per each excavation. Excavation soil samples will be collected using procedures described below. See Figures 4-1 through 4-3 for details on the planned excavation limits.

Former TAA 771 – One excavation will be conducted to remove approximately 4 cubic yards of subsurface contaminated soils. Therefore, a minimum of 5 confirmation soil samples will be collected (4 from the side walls and 1 from the bottom floor) and will be analyzed per sampling methods discussed in Section 6.2.

Former TAA 130C – Two separate excavations will be conducted to remove a total of approximately 10 cubic yards of subsurface contaminated soils. Therefore, a minimum of 10 confirmation soil samples will be collected (4 from the side walls and 1 from the bottom floor at each excavation) and will be analyzed per SW-846 analytical methods discussed in Section 6.2.

MSC P1 Unit 2, Building 493 – One excavation will be conducted to remove approximately 5 cubic yards of subsurface contaminated soils. Therefore, a minimum of 5 confirmation soil samples will be collected (4 from the side walls and 1 from the bottom floor) and will be analyzed per SW-846 analytical methods discussed in Section 6.2.

4.3 Excavation Confirmation Soil Sampling Procedures

EnCore® samplers will be used to collect excavation samples for VOC analysis. EnCore® sampling procedures are presented in Attachment 2. All other excavation samples will be collected using disposable scoops to minimize decontamination and equipment rinsate requirements. Nondisposable sampling equipment will be used if subsurface conditions do not permit the use of disposable scoops. If nondisposable equipment is used, it will be decontaminated before and after collection of each sample.

The following steps will be used to collect excavation soil samples:

1. Use a new, disposable, polyethylene scoop for each discrete sample.
2. Put on new, clean, and chemical-resistant disposable gloves.
3. Remove approximately 2 inches of topsoil to remove any disturbed soil.
4. For VOC samples, collect two 5-gram and one 25-gram EnCore® samples. In addition, fill a precleaned, 8-ounce, wide-mouth jar with soil.
5. For non-volatile samples, fill a precleaned, 8-ounce, wide-mouth jar with soil using disposable scoop. If samples are collected from a backhoe or excavator bucket, use a disposable scoop to transfer the sample into the jar. For MS/MSD samples, fill two precleaned, 8-ounce, wide-mouth jars.
6. Cap jars and place a signed and dated custody seal over each lid.
7. Place sample labels completed with the information described in Section 5.2 on the EnCore® samples and jars.
8. Place each sample container in a resealable bag.
9. Immediately place the resealable bag in a cooler with bagged ice.

10. Record the sample number, data, time, and description on the chain-of-custody form and in the field logbook. Write all entries in indelible black ink.

11. Package and ship the samples as described in Section 5.4.

4.4 Stockpile Sampling Procedures

Soil samples will be collected from soil stockpiles using the following steps:

1. One set of samples will be collected for every 50 yd^3 of stockpiled soil. A discrete sample will be taken from the top, center (2 to 3 feet into the stockpile using a backhoe bucket or equivalent), and base of the stockpile.

2. A backhoe bucket can be used to access the random sample point.

3. Put on new, clean, and chemical-resistant disposable gloves.

4. Fill a precleaned, 8-ounce, wide-mouth jar with soil using a disposable scoop. If samples are collected from the backhoe or excavator bucket, use a disposable scoop to transfer the sample into the jar.

5. Cap the jar and place a signed and dated custody seal over the lid.

6. Place sample labels completed with the information described in Section 5.2 on the jar.

7. Place each sample container in a resealable bag.

8. Immediately place the resealable bag in a cooler with bagged ice.

9. Record the sample number, data, time, and description on the chain-of-custody form and in the field logbook. Write all entries in indelible black ink.

10. Package and ship samples as described in Section 5.4.

4.5 Hand Auger Sampling Procedures

Soil samples, if required to delineate lateral extent of the excavations will be collected in brass or stainless steel sleeves from hand auger borings at former TAAs and/or MSC P1 sites. Each soil boring will be advanced in 1-foot depth intervals to the specified depth. The sample will be collected in a sleeve using a core soil sampler with a slide hammer attachment. The end of the sleeve can be screened visually and samples from the desired depth range can be removed and packaged for chemical analysis. EnCore® samplers will be used to collect soil samples for VOC and TPH as gasoline analysis. EnCore® sampling procedures are presented in Attachment 2. The samples will be properly labeled, packaged in resealable plastic bags, and stored in sample cooler containing resealable, bagged ice pending transportation to the analytical laboratory.

The following steps will be used to collect hand auger soil samples:

1. Advance boring by hand auger to the desired depth interval.
2. Decontaminate a hammer driven core soil sampler and load decontaminated brass or stainless steel sleeve.
3. Attach loaded sampler to slide hammer.
4. Drive sampler into sample point.
5. Remove sampler and retrieve sleeve.
6. For VOC and TPH as gasoline samples, from an end of the sleeve, collect three 5-gram EnCore® samples for each analysis.
7. Cap sleeve by placing a Teflon® sheet on each end and pushing a plastic cap over the Teflon® sheet.
8. Place sample labels completed with the information described in Section 5.2 on the EnCore® samples and sleeve.
9. Place each sample container in a resealable bag.
10. Collect additional sleeve if one sleeve is not enough for all the requested analysis.
11. Immediately place the resealable bag in a cooler with bagged ice.
12. Record the sample number, data, time, and description on the chain-of-custody form and in the field logbook. Write all entries in indelible black ink.
13. Package and ship the samples as described in Section 5.4.

4.6 Waste Characterization Sampling

Anticipated wastes expected to be produced during site verification activities include purge water, decontamination water, personal protective equipment (PPE), and debris.

Purge water, decontamination water, and soil cuttings will be contained in 55-gallon Department of Transportation (DOT)-approved drums or Baker tanks. The drums will be labeled and placed in a secure storage area. One representative sample from each soil and water waste stream will be collected and characterized. After reviewing analytical results, the waste will be classified and transportation and disposal options will be evaluated. If off-site transportation and disposal is required, RMA will procure subcontractors, prepare manifests, schedule removal of the waste, and acquire certificates of disposal or certificates of treatment. The wastes will be removed within 90 days from the start of accumulation. All manifests will be signed by a HAZMAT-

authorized representative. Waste classification criteria are listed in Table 4-1, Waste Classification Criteria.

Wastewater samples will be collected using a disposable bailer and the following steps:

1. Obtain an unused disposable bailer for each sampling event.
2. Put on new, clean, and chemical-resistant disposable gloves.
3. Tie the bailer to a nylon cord.
4. Lower the bailer into the containment area. Allow sufficient time for the bailer to fill with water.
5. Retrieve the bailer and fill appropriate bottles for the analyses being requested.
6. Cap the bottles and wipe any moisture from the outside of the bottles.
7. Place a sample label, completed with the information described in Section A.5.2, on each bottle.
8. Place each bottle in a resealable bag.
9. Immediately place the resealable bag in a cooler with the bagged ice for shipment to the analytical laboratory.

4.7 Sampling Equipment Decontamination Procedures

Nondisposable sampling equipment that comes in contact with samples (such as soil sampler, drill casing, hand auger flights, and bailers) will be decontaminated. This will be done to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by washing with a nonphosphate detergent such as Liquinox™ or equivalent. Decontamination water will be collected in 55-gallon DOT-approved drums or a poly-tank.

The following procedures will be used to decontaminate nondisposable sampling equipment:

1. Rinse with potable water. This step will decrease the gross contamination and reduce the frequency at which the nonphosphate detergent and water solution need to be changed. Change the water frequently.
2. Wash with nonphosphate detergent and water solution. This step will remove remaining contamination from the equipment. Dilute the nonphosphate detergent as directed by the manufacturer.
3. Rinse with potable water. This step will rinse the detergent solution from the equipment. Change the water frequently.

4. Rinse with deionized water. This step will rinse away detergent solution and potable water residues. Apply the deionized water from a stainless steel Hudson-type sprayer, Nalgene™ squeeze bottle, or equivalent while holding equipment over a 5-gallon bucket.

4.8 Preservatives, Holding Times and Sample Containers

Table 4-2 presents preservation and container requirements, and permissible holding times to ensure against degradation of sample integrity. Sample containers for soil and water will be certified precleaned according to EPA protocols.

5.0 SAMPLE HANDLING AND CUSTODY

The following section describes sample handling procedures, including sample numbering and labeling, chain-of-custody, and sample packaging and shipment.

5.1 Sample Numbering

A sample numbering system shall be used to identify each sample collected and submitted for analysis. The purpose of the numbering system is to assist in the tracking of samples and to facilitate retrieval of analytical results. The sample identification numbers for each sampling effort shall be used on sample labels, sample tracking matrix forms, COC forms, field logbooks, and all other applicable documentation. A listing of all sample identification numbers shall be recorded in the field logbook.

All samples submitted to the off-site laboratory will be uniquely numbered according to the following format:

XXXXXXX – YYYY - Z

Where **"XXXXXXX"** is the seven-digit RMA Inc., project number (i.e., **0422401**) and **"YYYY"** is a sequential number generated at the time of sample collection and recorded in the field logbook and on the chain-of-custody form. A complete description of the sample and sampling circumstances will be recorded in the field logbook and referenced to the unique sample identification number.

The last digit **Z** will either be "0" for a primary sample, "3" for a field duplicate sample, or "5" for an equipment rinsate sample.

A complete description of the sample, including detailed sample location and sample type (i.e., waste profile, confirmation, vertical delineation, field duplicate, trip blank, or MS/MSD) information will be recorded in the field logbook. A brief sample description will also be recorded on the COC form in the "Sample Description" column.

5.2 Sample Labeling

Sample labels are required for properly identifying samples and evidence. All samples shall be properly labeled with the label affixed to the container prior to transportation to the laboratory. Samples may be photographed so that labels are clearly readable for later identification. Information on sample labels shall include, but not be limited to, the following:

- Project Code. An assigned project number and site name.

- Sampling Location Number. A unique identifier assigned to a sampling point by the sampling team.
- Sample Identification Number. Each sample, including field control samples, collected for a project should be assigned a unique number. This assigned number incorporates information on the sample type and date as noted in Section 5.1.
- Samplers. Each sampler's name and signature or initials
- Preservative. Whether a preservative is used and the type of preservative.
- Analysis. The type of analysis requested.
- Date/Time. Identify the date and time the sample was taken.
- Type of Sample. The type of sample should be identified as discrete or composite.

5.3 *Chain-of-Custody (COC)*

COC custody procedures provide documentation of the handling of each sample from the time it is collected until it is destroyed. COC custody procedures are implemented so that a record of sample collection, transfer of samples between personnel, sample shipping, and receipt by the laboratory that will analyze the sample is maintained. Records concerning the cleaning of empty sample containers, container shipment from the laboratory to the site and security of empty containers at the site shall also be maintained. The COC record (Attachment A-3) serves as a legal record of possession of the sample. The COC record is initiated with the acquisition of the sample. The COC record shall remain with the sample at all times and bears the name of the person (field investigator) assuming responsibility for the samples. The field investigator is tasked with ensuring secure and appropriate handling of the bottles and samples. To simplify the COC record and eliminate potential litigation problems, as few people as possible shall handle the sample or physical evidence during the investigation. A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession.
- The sample is in the sampler's view after being in possession.
- The sample was in the sampler's possession and then was locked up to prevent tampering.
- The sample is in a designated secure area.

In addition to the COC record, there is also a COC (custody) seal. The COC seal (Attachment A-4) is an adhesive seal placed in areas such that if a sealed container is opened, the seal would be broken. The COC seal ensures that no sample tampering occurred between the field and the laboratory analysis.

5.3.1 Transfer of Custody and Shipment

All sample sets shall be accompanied by a COC record. When transferring possession of samples, the individual receiving the samples shall sign, date, and note the time that he/she received the samples on the COC record. This COC record documents transfer of custody of samples from the field investigator to another person, other laboratories, or other organizational units. Samples shall be properly packaged for shipment and delivered or shipped to the designated laboratory for analyses. Shipping containers shall be secured by using nylon strapping tape and custody seals. The custody seals shall be placed on the container so that it cannot be opened without breaking the seals. The seal shall be signed and dated by the field investigator. When samples are split with a facility, state regulatory agency, or other government agency, the agency representative must sign the COC record, if present. All samples shall be accompanied by the COC record. The original and one copy of the record shall be placed in a plastic bag taped to the inside lid of the secured shipping container. One copy of the record shall be retained by the field investigator or project leader. The original record shall be transmitted to the field investigator or project leader after samples are accepted by the laboratory. This copy shall become a part of the project file. If sent by mail, the package shall be registered with return receipt requested. If sent by common carrier, an air bill shall be used. Receipts from post offices and air bills shall be retained as part of the documentation of the COC. The air bill number or registered mail serial number shall be recorded in the remarks section of the COC record.

Laboratory chain of custody begins with sample receipt and continues until samples are discarded. The laboratory's chain-of-custody, sample storage, and dispersement for analysis shall be documented per specific laboratory SOPs and project requirements. Information on project custody, analysis, and data reporting requirements as noted shall be received by the laboratory prior to the first shipment of incoming samples. The laboratory should designate a specific individual as the sample custodian. The custodian will receive all incoming samples, sign the accompanying custody forms, and retain copies of the forms as permanent records. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks), the sample identification numbers, and any unique laboratory identification numbers for the samples. This information should be entered into a computerized laboratory information management system (LIMS). Once the sample transfer process is complete, the custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory will provide a secure storage area for all samples. Access to this area will be restricted to authorized personnel. The custodian will ensure that samples requiring special handling, including samples that are heat- or light-sensitive, radioactive, or have other unusual physical characteristics, will be properly stored and maintained prior to analysis.

5.4 *Sample Packaging and Shipment*

This section describes procedures for properly packaging and shipping environmental samples. Guidelines for proper container and preservative selection can be found in Section 4.4. Personnel that are involved in packaging, shipping, and receipt of samples shall be aware of Department of Transportation (DOT) regulations, know when to apply them, and know what procedures are needed to support this application. The following general procedures shall apply to the packaging of all environmental samples:

- Verify that the sample label is complete and adequately identifies the items described in Section 5.2.
- Verify that each sample cap/lid is secured on the bottle, and place each sample in a plastic bag. For multiple VOA vials, all vials from each sample location shall be placed in a small plastic bag at a minimum. Evidence tape or custody seals shall be placed over the sample lid and container, or over the seal of the bag for additional security, if desired.
- Squeeze as much air as possible from the bag, and seal the bag. Trip blanks are packaged in the same manner as that for aqueous VOA samples.
- Prepare the shipping container for use. For a commercial cooler, this includes taping the drain plug shut inside and out, and lining the cooler with a large plastic garbage bag. Place approximately 3 in. of inert packing material in the bottom of the liner. Place vermiculite or perlite on the bottom if the materials are liquid. Alternative shipping containers may be used if approved by project technical personnel.
- Place the samples upright in the lined cooler or storage container in such a way that the samples will not touch each other during shipment. Add inert packing material as necessary to ensure separation of samples.
- With the exception of aqueous metals analyses, all environmental samples should be shipped to the laboratory on ice and chilled to 4 °C ± 2 °C. If any of the shipped samples require cooling, place double bags of ice around the containers. Also include a 40-mL VOA vial filled with water for use as a temperature blank for the laboratory.
- Fill the cooler with packing material and tape the inner liner shut. NOTE: Do not use "environmentally friendly" peanuts made of starch to pack containers of liquids. These packing materials will dissolve when they get wet or moist.

- Place the paperwork being sent to the laboratory inside a plastic bag and tape it to the inside of the cooler lid. Include a copy of the COC form in the paperwork sent to the laboratory. The sampler keeps one copy of the COC form. Include any additional paperwork to notify the laboratory of project information (laboratory notification checklist), or if a sample is suspected of containing any substance for which laboratory personnel should take safety precautions.
- Close the cooler and seal it with strapping tape.
- Place at least two custody seals on the outside of the cooler (one on the front and one on the back). More custody seals may be used at the discretion of the sampler.
- Prepare standard air bill paperwork for shipment of the samples to the laboratory. Personnel should be aware of carrier weight or other policy restrictions

6.0 ANALYTICAL METHODS

The following section describes the requirements for analytical laboratories and the analytical methods that will be used.

6.1 Laboratory Requirements

Laboratories providing analytical data for this contract shall be currently certified by the California Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP) for analysis of hazardous materials for each method specified and shall have successfully completed the NFESC Laboratory Evaluation Program prior to beginning work. Selected laboratories are responsible for ensuring that their data collection and reporting activities and the associated activities of their subcontractors comply with the Navy's QA/QC requirements as defined in the Navy Installation Restoration Chemical Data Quality Manual (NFESC, 2001).

The laboratory must establish, implement, and maintain a quality system appropriate for the type, range, and volume of analytical services it provides. The elements of this quality system shall be documented within a Laboratory Quality Management Plan (LQMP) or related documentation. The Laboratory Quality Management Plan should present the policies, organization, objectives, functional guidelines, and specific QA and QC activities of the laboratory designed to achieve the data quality requirements when running performance-based methods, such as the SW-846 methods. SOPs pertaining to each element shall be included or referenced as part of this QA Management Plan and should describe the specific operational and analytical procedures as normally implemented by the laboratory.

Laboratory management is responsible for communicating the stated policies and practices to laboratory personnel, ensuring all information is clearly understood and implemented. The laboratory shall perform periodic audits of activities to verify compliance with the quality system. When deviations are discovered, the laboratory shall take immediate corrective action to remedy the situation or practice, notifying any client whose work may have been affected.

6.2 Analytical Requirements

For this project, Applied Physics and Chemistry Laboratory will conduct off-site analysis of soil and water samples. The laboratory was selected based on the ability to meet the project analytical and QC requirements, as well as the ability to meet the project schedule. The analytical methods selected for this project are standard EPA methods. The

methods are identical to the analytical methods used in previous projects at MCAS El Toro and should provide comparable data. With one exception, all methods are from EPA's SW-846 "Test Methods for Evaluating Solid Waste" (EPA 1996). Water samples (for waste disposal) will be analyzed for total petroleum hydrocarbons using a SW-846 method (Method 8015B) in conjunction with a procedure described in Appendix D of the State of California Leaking Underground Fuel Tank (LUFT) Field Manual (State of California 1989).

The following EPA SW-846 methods will be used for excavation confirmation soil sampling at Former TAAs 771 and 130C:

- TPH-purgeable (gasoline) by California leaking underground fuel tank (CA LUFT) Method 8015M
- TPH-extractable (diesel and JP5) by CA LUFT Method 8015M
- Pesticides and PCBs by EPA Method 8081A and 8082
- VOCs by EPA Method 8260B
- SVOCs with selected ion monitoring (SIM) by EPA Method 8270C
- Metals by EPA Method 6010B/7000A series.

The following EPA SW-846 methods will be used for excavation confirmation soil sampling at MSC P1 Unit 2, Building 493:

- Organo-chlorinated Pesticides, including Dicofol using EPA Method 8081
- Chlorinated Herbicides using EPA Method 8151
- Orano-phosphours Pesticides using EPA Method 8141
- Strychnine by EPA Method 8270
- Metals by EPA Method 6010B/7000A series.

6.3 Cleanup Goals

Cleanup goals for soil at TAAs 771, 130C and MSC P1 Unit 2 Building 493 will be based on:

- EPA Region 9 preliminary remediation goals (PRGs) for residential use for organic contaminants (EPA, 2002)
- Background concentrations (BNI, 1996b) or EPA Region 9 PRG values, whichever is greater, for residential land use for metal contaminants.

If soil analytical data from TAAs and MSC P1 sites suggest low concentrations of organic compounds and background levels of metals in the vadose zone, screening-level risk assessment/hazard index calculations (for carcinogenic and non-carcinogenic impacts

respectively) will be performed as applicable. The screening-level risk assessment will provide documentation that the remaining residual concentrations of organic and metal compounds do not pose a significant threat to human health or the environment.

7.0 QUALITY CONTROL

The entire sequence of sample gathering, preservation, storage, and shipment has unique potential errors associated with it, as do the events that occur in the analytical laboratory. A combination of unique field and laboratory QA/QC protocols and control samples will be incorporated into the project data collection program based upon project DQOs to assess sources of error at each stage of the sampling and analytical process.

7.1 Field Quality Control Samples

The applicability and appropriateness of the field sampling protocol shall be verified by the inclusion of a program of scheduled field control samples, such as field replicates (duplicates, splits), field blanks (rinsate [equipment], media, bottle, and trip), background (up gradient) samples, and single- or double-blind PE samples. All field control samples shall be handled exactly as the environmental samples. With the exception of matrix spikes/matrix spike duplicates (MS/MSDs), the identity of field control samples collected shall be held blind to the laboratory until the data are reported.

The following sections discuss the types and purposes of field QC samples that will be collected for this project.

7.1.1 Field Replicates

Field replicates are samples taken in quantity at a particular location or time in order to assess error associated with sample heterogeneity, sampling methodology applicability, and sample handling techniques. These replicates may be used for various purposes depending upon the intended use of the data or eventual analysis. The different types of replicates that will be collected for this project include field duplicates and MS/MSDs.

7.1.1.1 <u>Field Duplicates</u>

Field duplicates are secondary samples collected at the same time and from the same source as their corresponding primary samples. The purpose of duplicate samples is to evaluate the variability of the contaminant distribution in the sampled matrix. In general, field duplicates will represent at least 10% of all field samples.

Soil sample field duplicates will be collected as homogenized split samples for semi-volatile and non-volatile compound analysis. Some soil types are not suitable for homogenization (i.e. high clay content). In these cases field duplicates may be collected as collocated duplicates. For volatile organic analysis, soil sample field duplicates will be collected as collocated unhomogenized samples.

7.1.1.2 Matrix Spikes (MS)/Matrix Spike Duplicates (MSD)

MS/MSD samples are samples spiked at the laboratory with the contaminants of concern and analyzed together with the field samples. MS/MSD measure the laboratory's bias and precision. Additional volumes of sample for MS/MSD will be collected for every 20-field samples collected and will be submitted to the laboratory for MS/MSD analysis. Therefore, a MS/MSD pair will be analyzed at a frequency of 5% of all field samples.

Samples for MS/MSD analysis will be clearly identified on the COC record. MS/MSD samples are not collected for investigation derived waste samples.

7.1.2 Field Blanks

Whenever the possibility exists for contributing extraneous material into the sample collection, shipment, or analysis, a blank sample will be used to assess the magnitude of this contribution. Field blanks for this project will include equipment rinsate blanks and trip blanks.

7.1.2.1 Equipment Rinsate Blanks

Rinsate blanks are samples of analyte-free (deionized) water that are rinsed over decontaminated sampling equipment, collected, and submitted for analysis. These samples are used to assess cross-contamination from the sampling equipment, in addition to incidental contamination from the sample container and/or preservatives. When non-disposable sampling equipment is used, rinsate samples will be collected at a minimum frequency of one per day or per sampling event.

Source Blank: Source blanks are samples of source water used for decontamination and steam cleaning. At a minimum, one sample will be collected for each source of water for a given sampling event. The source blank will be analyzed for all appropriate laboratory analyses requested for environmental samples collected at the site. If an analyte is detected in the source blank, the appropriate validation flag will be applied to all sample results for equipment rinsate samples collected with the sampling equipment.

7.1.2.2 Trip Blanks

A trip blank consists of target analyte-free water provided by the project laboratory. The water is placed in a sealed container that accompanies the samples from collection through shipment. This QC sample serves as a check for cross-contamination of VOCs. Trip blanks are prepared and submitted to the laboratory at a frequency of one per cooler (for VOC analysis only) for those coolers containing aqueous samples to be analyzed for VOCs.

7.1.2.3 Temperature Blanks

A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and transportation. The laboratory shall record the temperature of the temperature blank upon receipt of the samples. Each cooler shall contain a temperature blank.

7.2 Laboratory Quality Control Samples

Laboratory overall method performance will be monitored by the inclusion of various internal quality control checks that allow an evaluation of method control (batch QC), and the effect of the sample matrix on the data being generated (matrix-specific QC). Batch QC is based on the analysis of a laboratory control sample (LCS) to generate accuracy (precision and bias) data and method blank (MB) data to assess the potential for cross-contamination. Matrix-specific QC shall be based on the use of an actual environmental sample for precision and bias determinations from the analysis of MSs, MSDs, matrix duplicates (MDs), and surrogate spikes. The overall quality objectives are to implement procedures for laboratory analysis and reporting of data that are indicative of the degree of quality consistent with their intended use. The QC protocols (the specific manner in which the QC checks are implemented) shall be specified by the laboratory's QA Management Plan (Section 6.1). The laboratory shall ensure that the requirements specified in the Navy Installation Restoration Chemical Data Quality Manual are incorporated into the QA Management Plan.

The types of laboratory QC samples that will be used for this project are discussed in the following sections.

7.2.1 Method Blanks (MBs)

Method blanks are prepared to evaluate whether contamination is originating from the reagents used in sample handling, preparation, or analysis. They are critical in distinguishing between low-level field contamination and laboratory contamination. A method blank consists of laboratory analyte-free water and all of the reagents used in the analytical procedure. It is prepared for every analysis in the same manner as a field sample and is processed through all of the analytical steps. Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

7.2.2 Laboratory Control Samples (LCSs)

A laboratory control sample (LCS) originates in the laboratory as deionized or distilled water that has been spiked with standard reference materials of a known concentration. A LCS is

analyzed to verify the accuracy of the calibration standards. These internal QC samples are also used to evaluate laboratory accuracy in the presence of matrix interference for field samples. LCSs are processed through the same analytical procedure as field samples. LCSs will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

7.2.3 Surrogate Standards

Surrogate standards consist of known concentrations of nontarget organic analytes that are added to each sample, method blank, and MS/MSD before samples are prepared and analyzed. The surrogate standard measures the efficiency of the analytical method in recovering the target analytes from an environmental sample matrix. Percent recoveries for surrogate compounds are evaluated using laboratory control limits. Surrogate standards provide an indication of laboratory accuracy and matrix effects for every field and QC sample that is analyzed for volatile and extractable organic constituents. Surrogate compounds are used in the analysis of VOCs to monitor purge efficiency and analytical performance, whereas surrogates are used in the analysis of extractable organic compounds to monitor the extraction process and analytical performance.

Factors such as matrix interference and high concentrations of analytes may affect surrogate recoveries. The effects of the sample matrix are frequently outside the control of the laboratory and may present unique problems. Laboratory personnel are required to re-extract (when applicable) and re-analyze samples when associated surrogates are outside of control limits. Data from both analyses of the samples in question are reported.

During validation, data will be qualified as estimated for any result that fails to meet surrogate criteria.

8.0 EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

This section outlines the testing, inspection, and maintenance procedures that will be used to keep both field and laboratory equipment in good working condition.

8.1 Maintenance of Field Equipment

Preventive maintenance for most field equipment shall be carried out in accordance with procedures and schedules recommended in (1) the equipment manufacturer's literature or operating manual, or (2) standard operating procedures (SOPs) that describe equipment operation associated with particular applications of the instrument. However, more stringent testing, inspection, and maintenance procedures and schedules shall be required when field equipment is used to make critical measurements.

A field instrument that is out of order will be segregated, clearly marked, and not used until it is repaired. The field team leader will be notified of equipment malfunctions so that prompt service can be completed quickly or substitute equipment can be obtained. When equipment condition is suspect, unscheduled testing, inspection, and maintenance shall be conducted. Any significant problems with field equipment will be reported in the daily field QCR.

8.2 Maintenance of Laboratory Equipment

Subcontractor laboratories shall provide sufficient equipment, instruments, and related supplies for proper performance of work. All equipment used shall be reflective of the measurement accuracy necessary. The laboratory shall ensure that all equipment and supplies purchased are inspected, a unique identifier assigned to it, and the equipment verified as compliant with all relevant requirements prior to their initial use. Records of all suppliers used to obtain support services and materials shall be maintained.

To minimize downtime and interruption of analytical work, preventive maintenance shall be routinely performed on each analytical instrument. Designated laboratory personnel shall be trained in routine maintenance procedures for all major instrumentation. When repairs are necessary, the equipment shall be taken out of service, repairs performed by either trained staff or trained service engineers, and an evaluation of the impact on previous calibrations or tests performed. Detailed SOPs shall be on file or the information incorporated into method SOPs/LQMP that describes preventive maintenance procedures and schedules. The laboratory shall maintain detailed logs for each instrument documenting the preventive maintenance and repairs performed.

Backup instruments shall be designated in case of an extended breakdown for an analytical instrument. It is the laboratory's responsibility to have a backup plan in force to ensure that all sample holding times can be met. This plan can include rental of backup instruments or the use of another Navy-certified laboratory for a given procedure. All equipment outside of the laboratory's permanent control shall be evaluated to ensure that all relevant requirements are met prior to its initial use. The laboratory shall ensure, and be able to document, that all subcontractors employed are competent to perform the duties requested. The laboratory shall maintain appropriate records or documentation for all instruments and support equipment to identify type of equipment; manufacturer's name or equipment make, model, and any serial numbers or unique identifiers; dates received and placed into service; condition when purchased (new, used, etc.); current location; manufacturer instructions/manuals; history of any damage, modification, or repair; instrument maintenance logs; and calibration/calibration verification run logs.

9.0 LABORATORY QUALITY ASSURANCE

The following sections discuss laboratory QA requirements. Also, calibration procedures that will be followed to ensure the accuracy of measurements made using field and laboratory equipment.

9.1 Laboratory Qualifications

The analytical laboratories selected to analyze samples for this project will be certified by the California Department of Health Services (DHS) through the Environmental Laboratory Accreditation Program for all the analytical methods required for the project. In addition, the laboratory will have successfully completed the NFESC's Laboratory Evaluation Program and will maintain that status throughout the project.

Laboratories selected for the project must be capable of meeting the turnaround time, project QC, and data deliverables requirements set forth in this SAP.

9.2 Laboratory Quality Assurance and Quality Control Program

Quality assurance involves a set of operating principles that, if strictly followed during sample collection and analysis, will produce defensible data of known quality. Included in quality assurance are quality control and quality assessments. Quality control is a set of measures within a sample analysis methodology to check that the process is in control. Quality assessment consists of procedures for determining the quality of laboratory measurements using data from internal and external QC measures.

A properly designed and executed QC program will result in a measurement system operating in a state of statistical control, which means that errors are reduced to acceptable levels. An effective QA program includes the following elements:

- Certification of operator competence
- Internal QC checks, such as recovery of known additions using surrogate standards, MS, and LCS
- Analysis of externally supplied standards
- Analysis of reagent blanks
- Calibration with standards using internal or external standard procedures
- Calibration verification with second source standard
- Analysis of duplicates
- Maintenance of control charts.

Strict adherence to good laboratory practices and consistent use of SOPs are also essential for a successful QC program. The laboratory will make the current revisions of SOPs readily available for all staff. At a minimum, SOPs will be written for the following procedures and methods: sample receipt/control/disposal, sample preparation/extraction, sample analysis, result calculations, database management, health and safety, and corrective actions.

The analytical laboratory will have written SOPs defining instrument operation and maintenance, tuning, calibration, MDL determinations, QC acceptance criteria, blank requirements, and stepwise procedures for each analytical method. SOPs will be available to all analysts in the laboratory. Any method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories must have the prior approval of RMA.

9.3 Calibration of Field Equipment

Field equipment will be calibrated at the beginning of the field effort and at prescribed intervals. The calibration frequency depends on the type and stability of equipment, the intended use of the equipment, and the recommendation of the manufacturer. Detailed calibration procedures for field equipment are available from the specific manufacturers' instruction manuals. All calibration information will be recorded in a field logbook or on field forms. A label that specifies the scheduled date of the next calibration will be attached to the field equipment. If this type of identification is not feasible, equipment calibration records will be readily available for reference.

9.4 Calibration of Laboratory Equipment

The calibration of laboratory instruments and support equipment is required to ensure that the analytical system is operating correctly and functioning at the proper precision, bias (accuracy), and sensitivity. Tables 9-1 to 9-4, Summary of Calibration Criteria and Corrective Action Procedures, present a summary of the QC requirements for each method.

All instruments will be calibrated and the calibration acceptance criteria will be met before samples are analyzed. Calibration standards will be prepared using National Institute for Standards and Testing-traceable standards and will be analyzed in accordance with method requirements. Initial calibration acceptance criteria documented in the laboratory SOPs will meet those of applicable guidance documents. The initial calibration will meet one of the following requirements:

The lowest concentration of the calibration standard will be less than or equal to the PQL, based on the final volume of the extract or sample.

For each target analyte, at least one of the calibration standards will be at or below the regulatory limit (action level) as defined by the DQOs.

Before samples are analyzed, the initial calibration will be verified with a second source standard prepared at the midpoint of the calibration curve. Initial calibration verification will meet the acceptance criteria set forth in the laboratory SOPs.

Daily calibration verification will be conducted at the method-prescribed frequencies and will meet the acceptance criteria of applicable guidance documents. Daily calibration verification will not be used for quantitation of target analytes.

Calibration data (calibration tables, chromatograms, instrument printouts, and laboratory logbooks) will be clearly labeled to identify the source and preparation of the calibration standard and will be traceable to the standard preparation records.

9.5 Preventive Maintenance

The primary objective of a preventive maintenance program is to help ensure the timely and effective completion of measurements by minimizing the downtime of crucial analytical equipment due to expected or unexpected component failure. To implementing such a program, efforts are focused in three primary areas: maintenance responsibilities, maintenance schedules, and adequate inventory of critical spare parts and equipment.

Maintenance responsibilities for laboratory equipment are assigned to the respective laboratory managers. The laboratory managers then establish maintenance procedures and schedules for each major piece of equipment. The procedures and schedules are documented in maintenance logbooks assigned to each instrument.

The effectiveness of any maintenance program depends, to a large extent, on adherence to specific routine maintenance for each major equipment item. Other maintenance activities can also be identified as requiring attention on an as-needed basis. Manufacturers' recommendations and sample throughput provide the basis for the established maintenance schedules. Manufacturers' service contracts typically outline primary maintenance for major instruments (e.g., GC/MS instruments, atomic absorption spectrometers, analytical balances, etc.). Maintenance activities for each instrument are documented in a maintenance log.

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment downtime. The inventory focuses on those parts and supplies that are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner if failure occurs.

The respective laboratory managers are responsible for maintaining an adequate inventory of necessary spare parts. Sufficient equipment must be kept on-hand to continue analyses in the event that an instrument experiences problems. In addition to backup instrumentation, the laboratory must maintain a supply of spare parts such as gas chromatography columns, fittings, and septa; atomic absorption lamps, mirrors, and diaphragms; graphite furnace tubes; and other ancillary equipment.

9.6 Training

The laboratory must have established policies and procedures for training and documenting each analyst's competency. Each staff member who performs sample preparation and analysis must demonstrate their proficiency through preparation and analysis of four LCSs, as described in EPA SW-846. An analyst will be considered proficient if the acceptance criteria for method accuracy and precision are met. The laboratory will maintain files of all training records.

9.7 Supplies and Consumables

The laboratory will inspect supplies and consumables prior to their use in analysis. Material specifications in the analytical methods will be used as a guideline for establishing the acceptance criteria for materials. Purity of reagents will be monitored by analysis of method blanks. An inventory and storage system will be implemented so that materials and supplies are used before manufacturers' expiration dates and are stored under safe and chemically compatible conditions.

9.8 Software Quality Assurance

Generation, compilation, and reporting of electronic data are critical components of laboratory operations. To produce defensible data of known quality, the laboratory will develop a software QA plan or an SOP that describes activities related to data generation, reduction, and transfer with modern tools of data acquisition and policies and procedures for procurement, modification, and use of computer software.

9.8.1 Software Validation

The laboratory will have procedures in place to ensure that all software used for data reduction, reporting, and transfer is adequate, correctly performs all intended functions, and does not perform any unintended functions.

The laboratory will verify, validate, and document the proper functioning of software immediately after installation of any new data acquisition and/or management systems. The baseline verification and validation could include the following actions:

- Comparison of computer printouts with reduced data and raw data
- Manual calculations to confirm correctness of all computer calculations
- Comparison of analytical reports against electronic deliverable files.

Baseline software validation will be documented in laboratory QA files. Continuing software verification will be conducted during sample analysis. To eliminate data entry errors during analytical sequence set-up, the correctness of results will be checked by one manual calculation per QC batch during data review. This verification will be documented in the QA/QC checklist for each data file.

9.8.2 Software Security

Only authorized and trained laboratory personnel will have access to operating and data management software. Each analyst will be trained in software use for operating different functional areas of the software systems and will have a password that allows access to these areas.

9.9 Manual Integration

Manual integration is sometimes necessary for proper compound quantitation in cases when there are overlapping or tailing peaks and sloping baselines. When justified, manual integration can be conducted for standards, samples, and QC check samples.

Manual integration could include valley-to-valley baselines, vertical peak separation, or slope integration. The type of manual integration will be based on the judgment of an analyst experienced in GC.

If a need for manual integration arises, the analysts performing the analysis will select a proper approach based on their professional judgment. Manual integration will be then conducted and documented in the data file. Once an approach has been selected, it will be used consistently for similarly affected peaks.

Manual integration documentation will include a copy of a computer-integrated chromatogram, a copy of a manually integrated chromatogram, a brief justification description, and the name of the person who performed the manual integration. The laboratory manager will review and approve all manual integrations performed by analysts.

10.0 ASSESSMENT AND OVERSIGHT

This section describes the field and laboratory assessments that may be conducted during the project, the individuals responsible for conducting assessments, corrective actions that may be implemented in response to assessment results, and how quality-related issues will be reported to RMA and Navy management.

10.1 ASSESSMENT AND RESPONSE ACTIONS

RMA and the Navy will oversee environmental data collection using the assessment and audit activities described below. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. This section describes the types of assessments that may be completed, RMA and Navy responsibilities for conducting the assessments, and corrective action procedures to address problems identified during an assessment.

10.1.1 Field Assessments

RMA conducts field assessments to support data quality and encourage continuous improvement in the systems that support environmental data collection. Technical systems audits (TSA) are the type of field assessment most frequently conducted. RMA personnel conducting TSAs use personnel interviews, direct observations, and reviews of project-specific documentation to evaluate and document whether procedures specified in the approved the SAP are being implemented. Specific items that may be observed during the TSA include:

- Availability of project plans such as the SAP and SHSP
- Documentation of personnel qualifications and training
- Sample collection, identification, preservation, handling, and shipping procedures
- Sampling equipment decontamination
- Equipment calibration and maintenance
- Completeness of logbooks and other field records (including nonconformance documentation)
- Health and safety procedures

During the TSA, the lead RMA assessor verbally communicates any significant deficiencies to the field team leader (FTL) for immediate correction. These and all other observations and comments are documented in a draft TSA report. The draft TSA report is issued to the RMA project manager, FTL, program QA manager, and project QA officer in electronic (e-mail)

format within 7 days after the TSA is completed. Project teams shall be required to respond to the draft report within 3 days, and a final TSA report is issued within 7 days after the project team responds.

The RMA program QA manager shall determine the frequency and duration of TSAs. Generally, TSAs are conducted early in the project so that any quality issues can be resolved before large amounts of data are collected. The RMA program QA manager will notify the Navy QA officer and RPM before a TSA is conducted so that they may attend the TSA and observe the field assessment.

The Navy QA officer may also independently conduct a field assessment of any RMA project. Items reviewed by the Navy QA officer during a field assessment would be similar to those described above.

The RMA program QA manager, in conjunction with the Navy QA officer, shall select which projects will receive a TSA. A schedule of field activities and planned TSAs is maintained and updated bimonthly. However, projects to receive TSAs are not firmly identified until field sampling activities are being initiated so that scheduling issues can be addressed.

10.1.2 Laboratory Assessments

NFESC conducts assessments of all laboratories that analyze samples collected under this contract. These assessments include (1) reviews of laboratory certifications, (2) initial and annual demonstrations of the laboratory's ability to satisfactorily analyze single-blind PE samples, and (3) laboratory audits. Laboratory audits may consist of an on-site review of laboratory facilities, personnel, documentation, and procedures, or an off-site evaluation of the ability of the laboratory's data management system to meet contract requirements.

10.1.3 Assessment Responsibilities

RMA personnel conducting assessments will be independent of the activity being evaluated. The RMA program QA manager will select the appropriate personnel to conduct each assessment and will assign them responsibilities and deadlines for completing the assessment. These personnel may include the program QA manager, project QA officer, or senior technical staff with relevant expertise and assessment experience.

When an assessment is planned, the RMA program QA manager selects a lead assessor who is responsible for:

- Selecting and preparing the assessment team
- Preparing an assessment plan

- Coordinating and scheduling the assessment with the project team, subcontractor, or other organization being evaluated
- Participating in the assessment
- Coordinating preparation and issuance of assessment reports and corrective action request forms
- Evaluating responses and resulting corrective actions

After the assessment is completed, the lead assessor will submit an audit report to the RMA program QA manger, project manager, and project QA officer; other personnel may be included in the distribution as appropriate. Assessment findings will also be included in the quality control summary report for the project.

The Navy QA officer is responsible for coordinating all audits that may be conducted by Navy personnel for this project. Audit preparation, completion, and reporting responsibilities for Navy auditors would be similar to those described above.

10.1.4 Field Corrective Action Procedures

Field corrective action procedures will depend on the type and severity of the finding. RMA classifies assessment findings as either deficiencies or observations. Deficiencies are findings that may have a significant impact on data quality and that will require corrective action. Observations are findings that do not directly affect data quality, but are suggestions for consideration and review.

As described in Section A.10.1.1, project teams are required to respond to deficiencies identified in TSA reports. The project manager, FTL, and project QA officer will meet to discuss the deficiencies and the appropriate steps to resolve each deficiency by:

- Determining when and how the problem developed
- Assigning responsibility for problem investigation and documentation
- Selecting the corrective action to eliminate the problem
- Developing a schedule for completing the corrective action
- Assigning responsibility for implementing the corrective action
- Documenting and verifying that the corrective action has eliminated the problem
- Notifying the Navy of the problem and the corrective action taken

In responding to the TSA report, the project team will include a brief description of each deficiency, the proposed corrective action, the individual responsible for determining and

implementing the corrective action, and the completion dates for each corrective action. The project QA officer will use a status report to monitor the status of all corrective actions.

The RMA program QA manager is responsible for reviewing proposed corrective actions and verifying that they have been effectively implemented. The program QA manager can require data acquisition to be limited or discontinued until the corrective action is complete and a deficiency is eliminated. The program QA manager can also request the reanalysis of any or all data acquired since the system was last in control.

10.1.5 Laboratory Corrective Action Procedures

When errors, deficiencies, or out-of-control situations exist, the laboratory's QA program shall include a system of QC activities that measure the system performance to verify that it meets stated requirements and objectives. When the analytical system performance does not meet defined standards, the laboratory shall employ corrective actions to resolve problems and restore proper functioning to the analytical system(s). Laboratory personnel are alerted that corrective actions are necessary under the following conditions:

- QC data are outside the measurement quality objectives for precision and bias
- Blanks or LCSs contain contaminants above acceptable levels
- Undesirable trends are detected in spike recoveries or the RPD between duplicates
- There are unusual changes in method detection limits (MDLs)
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation (PE) samples
- Inquiries concerning data quality are received from a project manager

Corrective actions are often handled at the bench level by the analyst, who reviews the sample preparation procedures for possible errors and checks the instrument calibration, spike, calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter will be referred to the laboratory supervisor, manager, or QA department for further investigation. Once resolved, full documentation of the corrective action procedure shall be filed with the project-specific records.

10.1.6 Calculation Errors

Reports shall be reissued if calculation or reporting errors are noted with any given data package. The case narrative shall clearly state the reason(s) for reissuance of the report.

10.2 REPORTS TO MANAGEMENT

Effective management of environmental data collection requires (1) timely assessment and review of all activities and (2) open communication, interaction, and feedback among all project participants. RMA will use the report described below to address any project-specific quality issues and to facilitate timely communication of these issues.

10.2.1 Daily Progress Reports

RMA will prepare a daily progress report (contractor production reports) to summarize activities throughout the field investigation. This report will describe sampling and field measurements, equipment used, RMA and subcontractor personnel on site, QA/QC and health and safety activities, problems encountered, corrective actions taken, deviations from the SAP, and explanations for the deviations. The daily progress report is prepared by the field team leader and submitted to the project manager and to the Navy RPM, if requested. The content of the daily reports will be summarized and included in the final report submitted for the field investigation.

11.0 DATA REVIEW, REPORTING AND VALIDATION

This section describes the procedures that are planned to review and validate field and laboratory data. This section also discusses the requirements for preparing laboratory data packages.

11.1 Data Review and Verification

Review and verification of the data generated during field and laboratory activities are essential to obtaining data of defensible and acceptable quality

11.1.1 Field Data Review

Project team personnel will verify field data through reviews of data sets to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this project-specific SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

11.1.2 Laboratory Data Review

All analytical data generated by the laboratory shall be extensively reviewed prior to report release to assure the validity of the reported data. This internal data evaluation process shall cover the areas of data generation, reduction, and a minimum of three levels of documented review. For each level, the review process shall be documented using an appropriate checklist that is signed and dated by the reviewer. The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the data evaluation is essential in ensuring that data of known quality are generated consistently. All data generated and reduced shall follow well-documented in-house protocols.

11.1.3 Data Qualifiers

Data qualifiers shall be added by the laboratory during the data generation/ review process. These qualifiers will be applied when measurement quality objectives are not met and corrective action is not successful or when corrective action is not performed. All flags used by the laboratory shall be defined completely within the chemical data reportable packages. The following data qualifiers are suggested for use:

- U= Nondetect when analyte concentration is below MRL.
- J= Estimated concentration when analyte concentration falls below the MQL (i.e., lowest calibration standard).
- B= Blank contamination when any associated blanks are above one-half the MRL.
- Q= Data requires usability review due to the exceedance of method-specific holding times, calibration, or batch QC data associated with the samples do not meet stated measurement quality objectives.

These flags shall also identify any suspected bias in the data, either low or high, and whether the estimation is related to the suspected identification (qualitative) or whether the value reported is an approximation (quantitative). The project manager or appropriate technical personnel shall be notified as soon as possible to discuss possible corrective actions should data be qualified. Additional data flagging may be performed based upon overall project-specific requirements, through the use of external data review or validation.

11.2 Data Reporting

The data package shall contain enough information to demonstrate that the project DQOs has been fulfilled. In general, one should be able to determine the precision, bias, representativeness, comparability, and sensitivity of the data from information contained in the data package. This description applies to both primary and referee laboratory packages. The amount of information required to demonstrate attainment of DQOs depends upon the acceptable level of uncertainty for the intended data use. In general, the type of data package required will fall into one of two general categories: Comprehensive (EPA Level IV) and Definite (EPA Level III). Data packages will be prepared to meet the requirements for data package contents that are presented in Tables 11-1 through 11-4.

For this project, 20 percent of the data shall be submitted in an EPA Level IV equivalent data package and 80 percent submitted in an EPA Level III equivalent data package. All reported data packages must be retained by the laboratory for a minimum of 10 years. In the event of laboratory closure, all applicable documents must be transferred to the Navy client.

11.2.1 Electronic Data Deliverables (EDDs)

EDDs are required for all soil, soil vapor and groundwater analytical results at MCAS El Toro. An automated LIMS must be used to produce the EDD. Manual creation of the deliverable (data entry by hand) is unacceptable. The laboratory will verify EDDs internally before they are issued. The EDD will correspond exactly to the hard-copy data. No duplicate data will be submitted. EDDs will be delivered in Geotracker format compatible with Navy Environmental Data Transfer Standards (NEDTS). Results that should be included in all EDDs are as follows:

- Target analyte results for each sample and associated analytical methods requested on the chain-of-custody form
- Method and instrument blanks and preparation and calibration blank results reported for the sample delivery group (SDG)
- Percent recoveries for the spike compounds in the MS, MSDs, blank spikes, or LCSs
- Matrix duplicate results reported for the SDG
- All re-analysis, re-extractions, or dilutions reported for the SDG, including those associated with samples and the specified laboratory QC samples

Electronic copy data must be retained for a minimum of 3 years after final data have been submitted. The subcontractor will use an electronic storage device capable of recording data for long-term, off-line storage. Raw data will be retained on an electronic data archival system.

11.3 Data Validation

An independent third-party contractor will validate all laboratory data in accordance with current EPA national functional guidelines (EPA 1994, 1999c, 2002). The data validation strategy will be consistent with the requirements of *Environmental Work Instruction 3EN2.1-Chemical Data Validation (U.S. Navy Southwest Division, 2001a)*. For this project, 80 percent of the data will undergo cursory validation (EPA Level III) and 20 percent of the data will undergo full validation (EPA Level IV). Requirements for cursory and full validation are listed below.

11.3.1 Cursory Data Validation

Cursory validation will be completed on the summary data packages for analysis of soil samples. The data reviewer is required to notify RMA and request any missing information needed from the laboratory. Elimination of the data from the review process is not allowed. All data will be qualified as necessary in accordance with established criteria. Data summary packages will consist of sample results and QC summaries, including calibration and internal standard data.

11.3.2 Full Data Validation

Full validation will be completed on full data packages for analysis of soil samples. The data reviewer is required to notify RMA and request any missing information needed from the laboratory. Elimination of data from the review process is not allowed. All data will continue through the validation process and will be qualified in accordance with established criteria. Data summary packages will consist of sample results, QC summaries, and all raw data associated with the sample results and QC summaries.

11.3.3 Data Validation Criteria

Table 11-5 lists the QC criteria that will be reviewed for both cursory and full data validation. The data validation criteria selected from Table 11-5 will be consistent with the project-specific analytical methods listed in Section 6.2.

11.4 Data Review and Data Quality Assessment Report

RMA will review the standard laboratory data packages to establish that holding times for extraction and analysis, calibration requirements, and internal QC check requirements have been met. RMA will review all analytical data.

Based on data validation/review, RMA will determine if the project DQOs have been met and will calculate data completeness. To reconcile the collected data with project DQOs and to establish and document data usability, the project chemist will prepare a data quality assessment report. The report will address the following topics:

- Implementation of sampling design and analysis according to the approved SAP (or sample completeness and representativeness)
- Proper frequency of field QC samples and adequacy of field decontamination procedures
- Accuracy and precision of data collected
- Data comparability, if appropriate
- Data usability for project decisions.

The data quality assessment will be included in the final project report.

12.0 MANAGEMENT AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

Investigation-derive waste (IDW) generated from the field work will consist of following two types:

- Personal protective equipment (PPE); and
- Wastewater (decontamination water)

PPE: PPE generated during field activities (e.g., tyveks, gloves, paper towels, and sampling supplies) will be collected in plastic bags and stored in DOT-approved 55-gallon drums. The bags will be labeled to indicate the soil boring location, contents, and collection date. If the soil collected from the soil boring is characterized as hazardous, then the corresponding PPE will be disposed as hazardous waste. Otherwise, all PPE will be disposed as non-hazardous waste.

Wastewater: Separate, properly labeled DOT-approved 55-gallon drums will be used to collect decontamination water for all field decontamination activities. All liquid IDW will be transported off-site for appropriate treatment. Additional samples of liquid IDW will be analyzed for the contaminants of concern for disposal purposes. Decontamination water samples for waste characterization will be collected using disposable bailers. The samples will be collected in new, precleaned, bottle(s) with the appropriate preservative provided by the analytical laboratory. The samples will be labeled and packaged for laboratory submittal. The following summarizes the sampling procedures to be used:

1. Obtain a disposable bailer. A new bailer shall be obtained for each sample event.
2. Put on a new, clean, and chemical-resistant pair of disposable gloves.
3. Secure the bailer with nylon cord.
4. Lower the bailer into the Baker tank, drum, or other containment area. Allow sufficient time for the bailer to fill with water.
5. Retrieve the bailer and fill appropriate bottle(s) for analyses being requested. Note: For MS/MSD samples only, collect three sets of bottles.
6. Cap the bottle(s) and wipe any moisture from the outside of the bottle(s).
7. Affix a signed and dated custody seal over the cap(s) of bottle(s).
8. Place a sample label, completed with the information described in Section A.5.2, on the bottle.
9. Place the bottle in a resealable bag.
10. Place the resealable bag containing the sample in a cooler with bagged ice for shipment to the analytical laboratory.

Off-site disposal of waste will be coordinated by RMA. The Navy will be the generator and will sign any manifests. All waste will be stored on-site no longer than 90 days after date of generation. IDW will be profiled, transported, and disposed off in accordance with applicable Federal, State, and local regulations.

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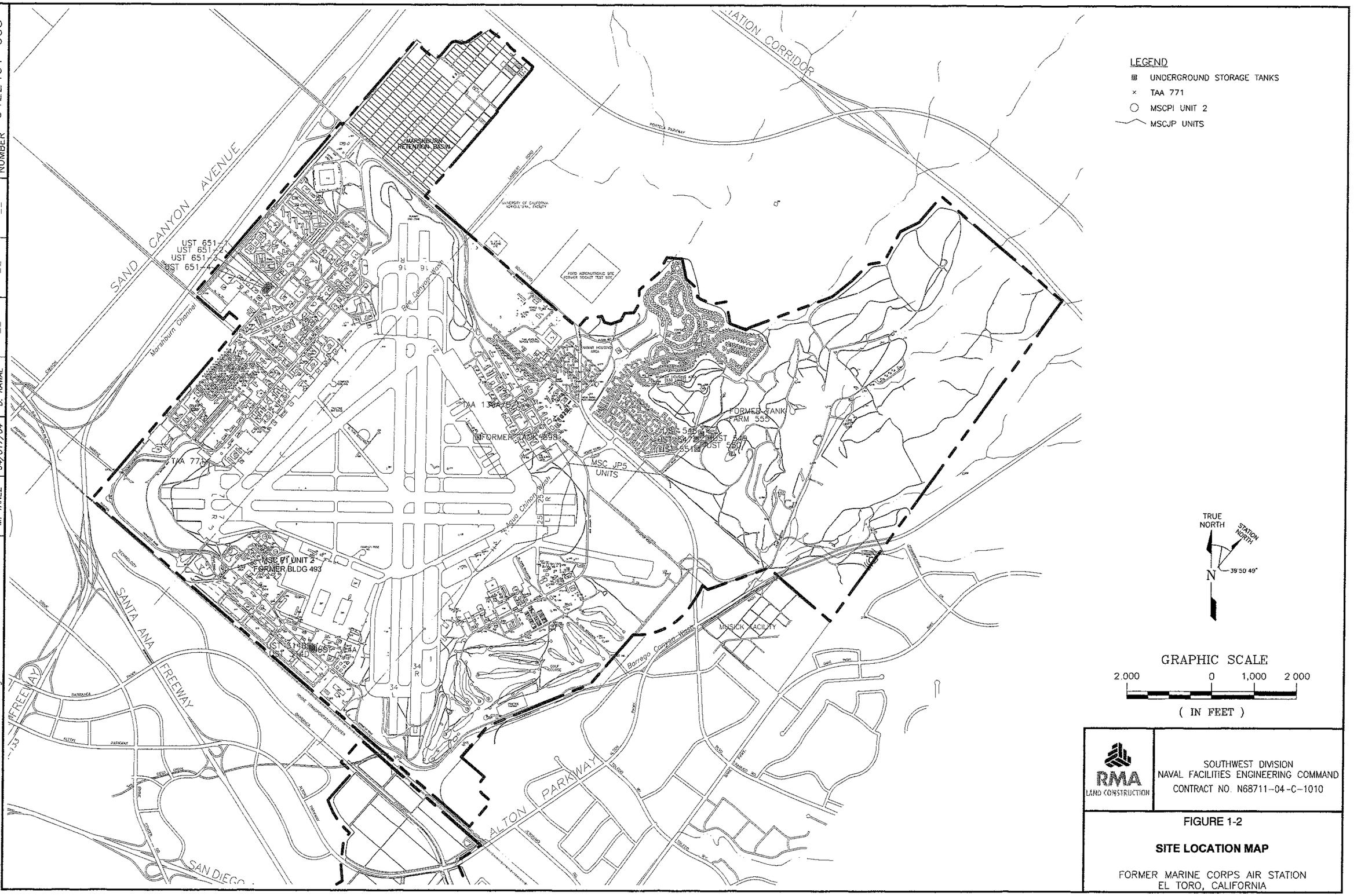
FIGURES



RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-04-C-1010

FIGURE 1-2

SITE LOCATION MAP

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 04/017/04	D. RAWAL --	-- --	0422401-005

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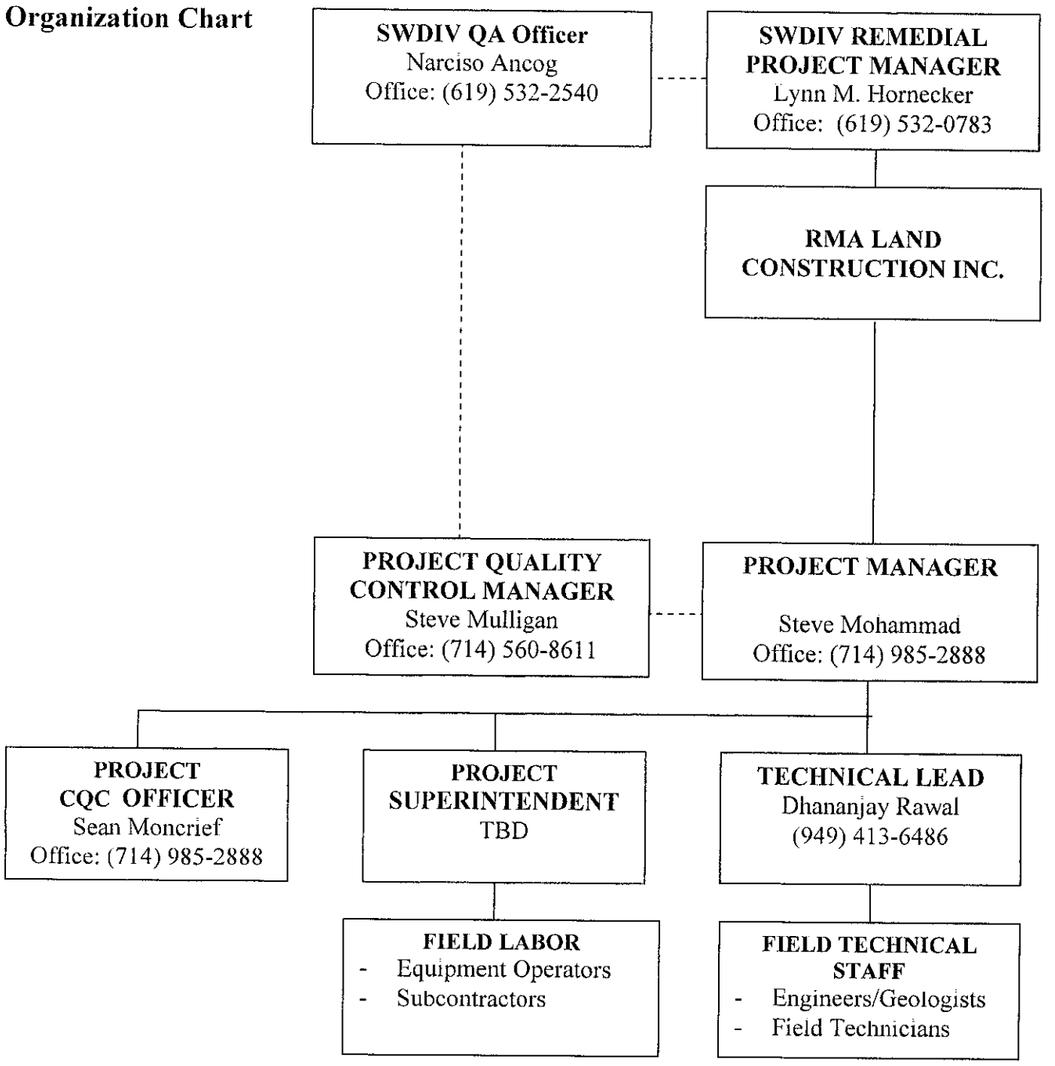
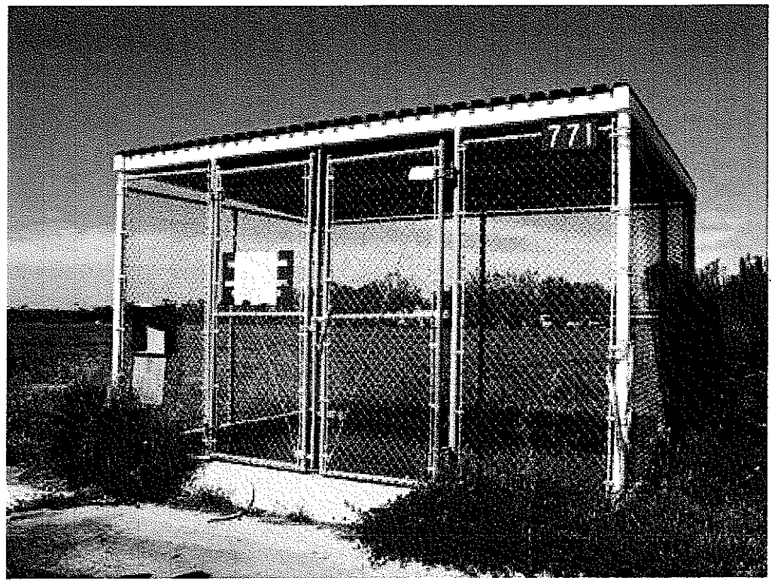
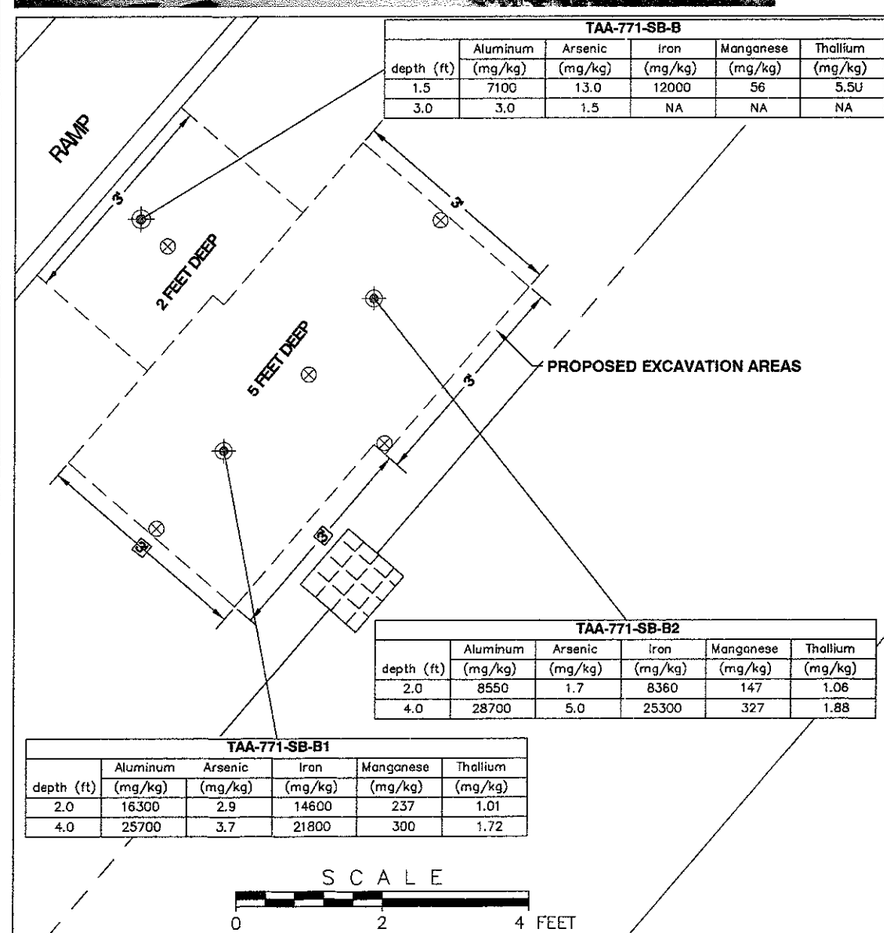
Figure 1-3
Project Organization Chart







TAA-771-SB-B

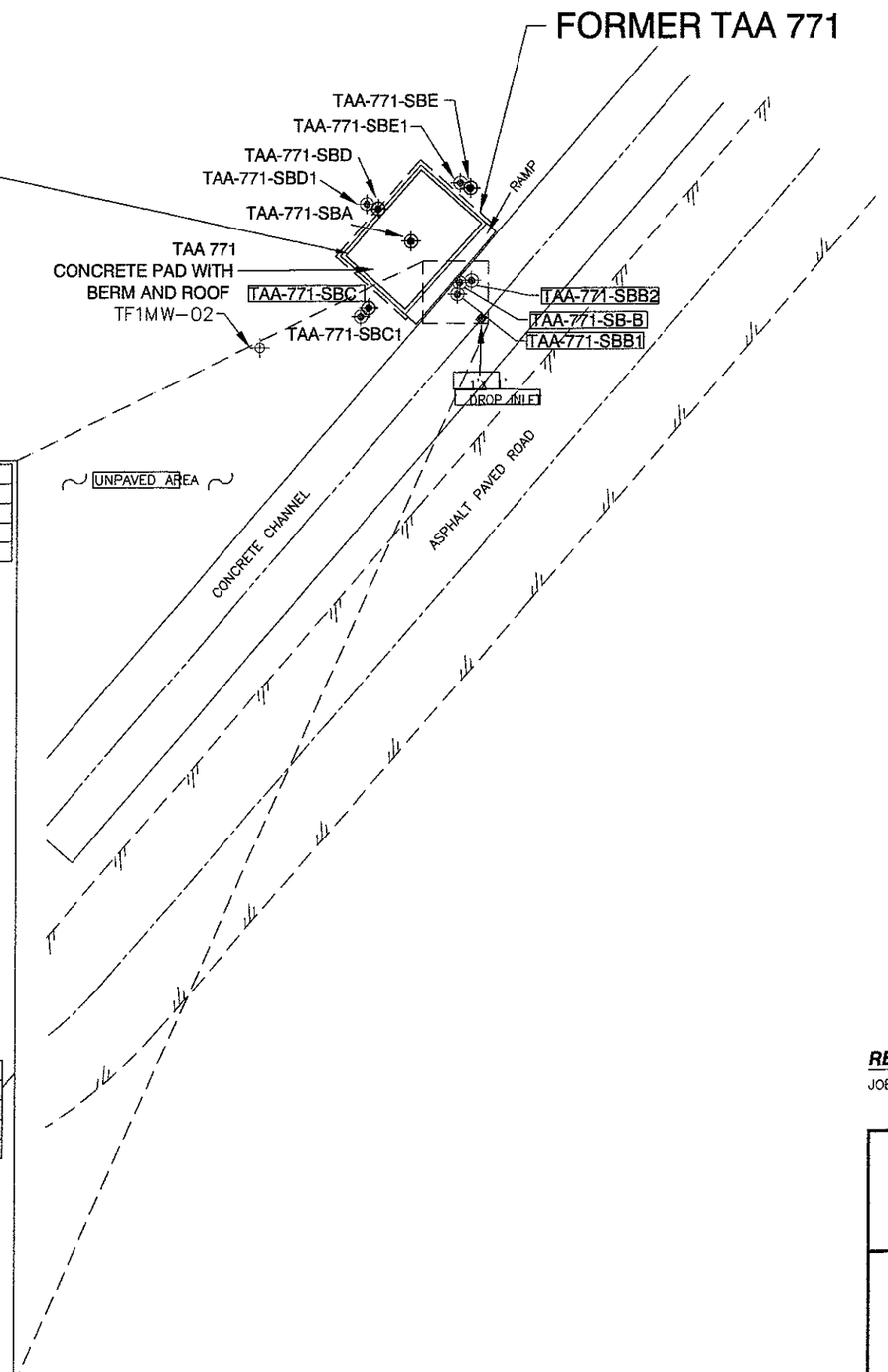
depth (ft)	Aluminum (mg/kg)	Arsenic (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Thallium (mg/kg)
1.5	7100	13.0	12000	56	5.5U
3.0	3.0	1.5	NA	NA	NA

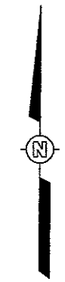
TAA-771-SB-B2

depth (ft)	Aluminum (mg/kg)	Arsenic (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Thallium (mg/kg)
2.0	8550	1.7	8360	147	1.06
4.0	28700	5.0	25300	327	1.88

TAA-771-SB-B1

depth (ft)	Aluminum (mg/kg)	Arsenic (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Thallium (mg/kg)
2.0	16300	2.9	14600	237	1.01
4.0	25700	3.7	21800	300	1.72





EXPLANATION:

- GROUNDWATER MONITORING WELL
- SHAW 1997 CONFIRMATION SAMPLE LOCATION
- SHAW 2003 CONFIRMATION SAMPLE LOCATION
- PROPOSED EXCAVATION CONFIRMATION SOIL SAMPLE LOCATION
- CENTERLINE OF STREET
- EDGE OF PAVEMENT
- CENTER OF CONCRETE CHANNEL
- PROPOSED EXCAVATION
- DROP INLET

SCALE
0 20 40 FEET

REFERENCE:
JOB NO. 97102-07C DWG BY CALVADA SURVEYING, INC

RMA LAND CONSTRUCTION

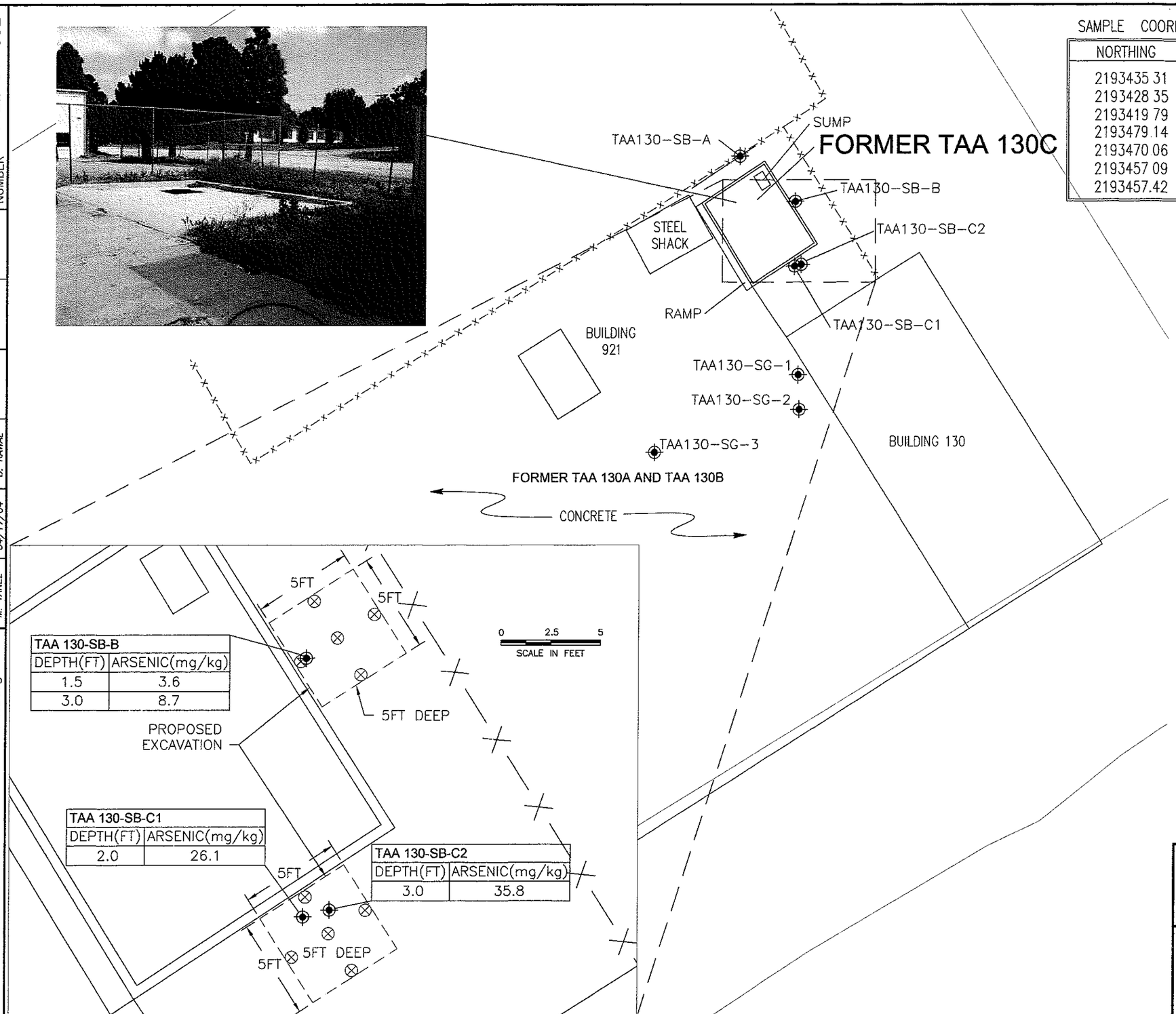
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-04-C-1010

FIGURE 4-1

PROPOSED SOIL SAMPLING LOCATION MAP
FORMER TAA-771

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWING NUMBER 0422401-003
APPROVED BY --
CHECKED BY D. RAWAL
DRAWN BY M. YANEZ 4/17/04
0422401-003.dwg
4/23/2004 8:28 AM



TAA 130-SB-B	
DEPTH(FT)	ARSENIC(mg/kg)
1.5	3.6
3.0	8.7

TAA 130-SB-C1	
DEPTH(FT)	ARSENIC(mg/kg)
2.0	26.1

TAA 130-SB-C2	
DEPTH(FT)	ARSENIC(mg/kg)
3.0	35.8

SAMPLE COORDINATE LISTING

NORTHING	EASTING	FS	DESCRIPTION
2193435.31	6114609.31	405.39	TAA130-SG-1
2193428.35	6114609.53	405.25	TAA130-SG-2
2193419.79	6114580.42	404.29	TAA130-SG-3
2193479.14	6114597.45	405.59	TAA130-SB-A
2193470.06	6114608.65	405.56	TAA130-SB-B
2193457.09	6114608.53	405.59	TAA130-SB-C1
2193457.42	6114609.86	405.59	TAA130-SB-C2

LEGEND

- PREVIOUS SHAW SHALLOW CONFIRMATION SAMPLE POINTS
- PROPOSED EXCAVATION CONFIRMATION SOIL SAMPLE LOCATION
- CHAIN LINK FENCE
- PROPOSED EXCAVATION AREA

N

GRAPHIC SCALE

0 10 20 40

(IN FEET)

RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO N68711-04-C-1010

FIGURE 4-2

PROPOSED SOIL SAMPLING LOCATIONS MAP
FORMER TAA-130C

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWING NUMBER 0422401-002

APPROVED BY

CHECKED BY D. RAWAL

DRAWN BY M. YANEZ 04/17/04

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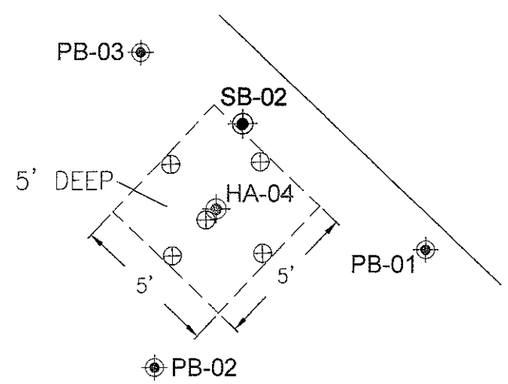
DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 04/17/04	D. RAWAL --	-- --	0422401-04

Sample Location

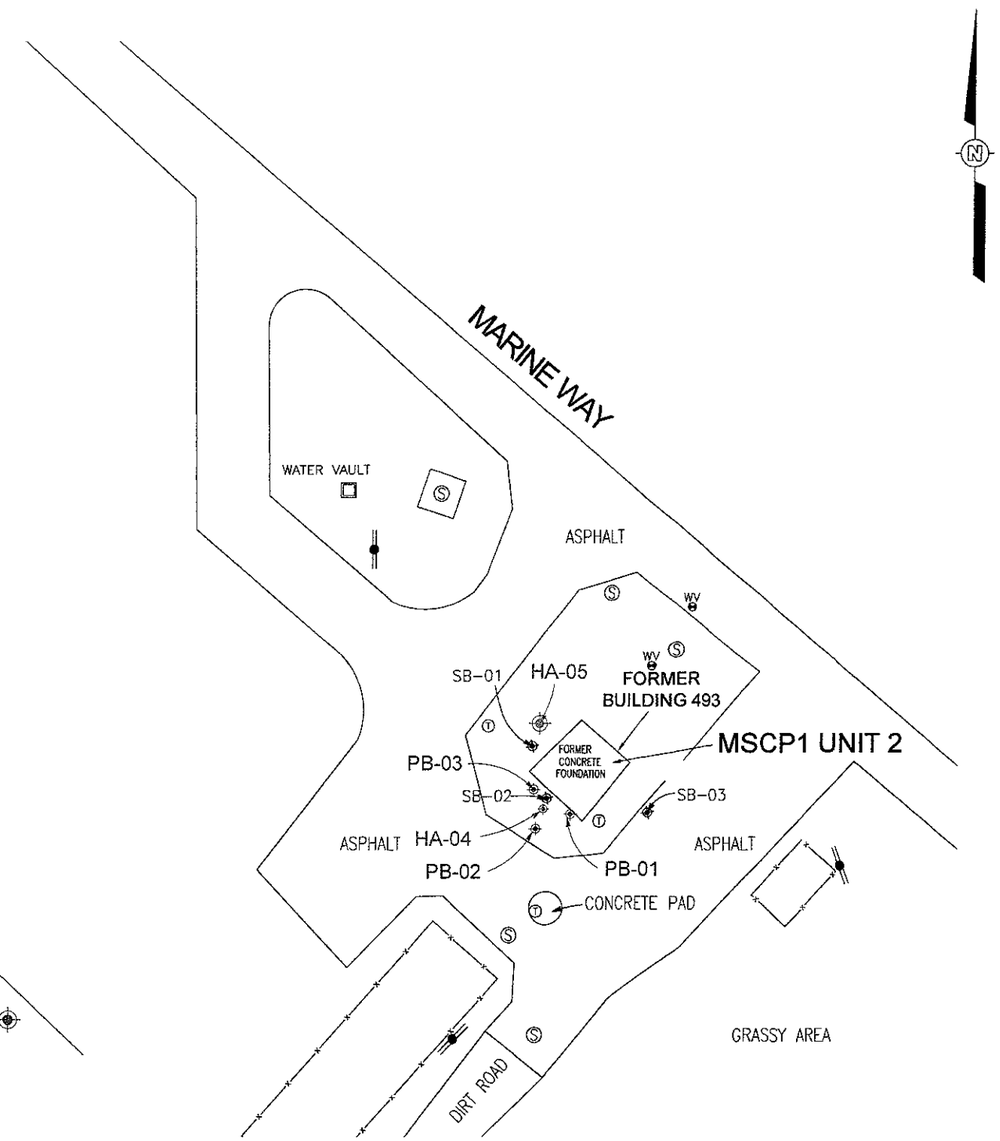
Boring Number	Location: Northing (NAD 83)	Easting (NAD 83)	Elevation (ft msl)
HA03	2189715 16	6107394 03	254 07
HA04	2189554 11	6107533 06	255 32
HA05	2189577 37	6107532.04	255 42
PB01	2189552 72	6107540 23	255 28
PB02	2189548 73	6107530 97	255 13
PB03	2189559 42	6107530 44	255 36

EXPLANATION:

- PREVIOUS OHM PESTICIDE SAMPLE LOCATION
- OHM HAND AUGER SAMPLE LOCATION
- OHM SAMPLE LOCATION (PREVIOUS)
- SEWER MANHOLE
- TELEPHONE MANHOLE
- POWER POLE
- CHAIN LINK FENCE
- WATER VALVE
- EDGE OF PAVEMENT
- PROPOSED EXCAVATION CONFIRMATION SOIL SAMPLE LOCATION
- PROPOSED EXCAVATION AREA



PROPOSED EXCAVATION
SCALE: 1"=5'



SCALE
0 40 80 FEET

RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO N68711-04-C-1010

FIGURE 4-3
PROPOSED SOIL SAMPLING LOCATIONS MAP
MSC P1 UNIT 2 FORMER PESTICIDE STORAGE AREA FORMER BUILDING 493
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

4/21/2004 5:32 PM 0422401-004.dwg

TABLES

TABLE 1-1
KEY PERSONNEL AND RESPONSIBILITIES

Name	Organization	Role	Responsibilities	Contact Information
Lynn Hornecker	Navy	Remedial Project Manager	• Responsible for overall project execution and for coordination with base representatives, regulatory agencies and Navy management • Actively participate in DQO process	Naval Facilities Engineering Command Southwest Division (619) 532-0783
Narciso A Ancog	Navy	QA Officer	• Responsible for QA issues for all Navy work under this contract • Reviews and approves SAP and any significant modifications • Has authority to suspend project activities if Navy quality requirements are not met	Naval Facilities Engineering Command Southwest Division (619) 532-2540
Steve Mohammad	RMA	Project Manager	• Responsible for implementing all activities called out in the Contract • Prepares or supervises preparation of SAP • Monitors and directs field activities to ensure compliance with SAP requirements	RMA, Inc. Brea, CA (714) 985-2888
Stephen Mulligan	RMA	Program QA Manager	• Responsible for regular discussion and resolution of QA issues with Navy QA officer • Provides program-level QA guidance to project manager and project teams • Reviews and approves SAP • Identifies nonconformance through audits and other QA review activities and recommends corrective action	RMA, Inc Brea, CA (714) 985-2888

Sean Moncrief	RMA	Project CQC	• Responsible for providing guidance to project teams preparing SAPs • Verifies that data collection methods specified in SAP comply with Navy and RMA requirements • May conduct laboratory evaluations and audits	RMA, Inc. Brea, CA (714) 985-2888
TBD	RMA	Field Team Leader/Site H&S Officer	• Responsible for directing day-to-day field activities conducted by RMA and subcontractor personnel • Verifies that field sampling and measurement procedures follow SAP • Provides project manager with regular reports on status of field activities • Responsible for implementing health and safety plan and for determining appropriate site control measures and personal protection levels	RMA, Inc. Brea, CA (714) 985-2888

Table 2-1
Project Required Reporting Limits, EPA Method 8015B (TPH)

Compound Name	Soil			Water	
	RL	Cleanup Goal	Unit	RL	Unit
Total petroleum hydrocarbons as gasoline, carbon range C_6 to C_{12}	1.0	NE	mg/kg	0.5	mg/L
Total petroleum hydrocarbons as diesel fuel, carbon range C_{12} to C_{24}	10	NE	mg/kg	0.5	mg/L
Total petroleum hydrocarbons as motor oil, carbon range C_{20} to C_{36}	100	NE	mg/kg	1.0	mg/L

NE - Not established, will be determined using guidance from "Interim Site Assessment and Cleanup Guidebook," May 1996, see Section 6.3

Table 2-2
Project Required Reporting Limits, EPA Method 8260B (Volatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
1,1,1-Trichloroethane	5	1,200,000	µg/kg	5	µg/L
1,1,2,2-Tetrachloroethane	5	410	µg/kg	1	µg/L
1,1,2-Trichloroethane	5	730	µg/kg	5	µg/L
1,3,5-Trimethylbenzene	5	21,000	µg/kg	5	µg/L
1,2,4-Trimethylbenzene	5	52,000	µg/kg	5	µg/L
1,2,3-Trichlorobenzene	5	NE	µg/kg	5	µg/L
1,2,4-Trichlorobenzene	5	650,000	µg/kg	5	µg/L
1,2,3-Trichloropropane	1	5	µg/kg	0.5	µg/L
1,2-Dichlorobenzene	5	370,000	µg/kg	5	µg/L
1,3-Dichlorobenzene	5	16,000	µg/kg	5	µg/L
1,4-Dichlorobenzene	5	3,400	µg/kg	5	µg/L
1,1-Dichloroethane	5	2,800	µg/kg	5	µg/L
1,1-Dichloroethene	5	120,000	µg/kg	5	µg/L
1,2-Dichloroethane	5	280	µg/kg	0.5	µg/L
1,2-Dichloropropane	5	340	µg/kg	5	µg/L
Acetone	50	1,600,000	µg/kg	50	µg/L
Methyl ethyl ketone (MEK)	50	7,300,000	µg/kg	50	µg/L
Methyl isobutyl ketone (MIBK)	50	790,000	µg/kg	50	µg/L
Methyl tert-butyl ether (MTBE)	10	17,000	µg/kg	5	µg/L
2-Hexanone	50	NE	µg/kg	50	µg/L
Vinyl acetate	50	430,000	µg/kg	50	µg/L
Benzene	5	600	µg/kg	0.5	µg/L
Bromodichloromethane	5	820	µg/kg	5	µg/L
Bromoform	5	62,000	µg/kg	5	µg/L
Bromomethane	5	3,900	µg/kg	5	µg/L
Bromobenzene	5	28,000	µg/kg	5	µg/L
n-Butylbenzene	5	240,000	µg/kg	5	µg/L
Sec-Butylbenzene	5	220,000	µg/kg	5	µg/L
Tert-Butylbenzene	5	390,000	µg/kg	5	µg/L

Table 2-2, Cont.
Project Required Reporting Limits, EPA Method 8260B (Volatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
Carbon disulfide	5	360,000	µg/kg	5	µg/L
Carbon tetrachloride	5	250	µg/kg	0.5	µg/L
Chlorobenzene	5	150,000	µg/kg	5	µg/L
Chloroethane	5	3,000	µg/kg	5	µg/L
Chloroform	5	940	µg/kg	5	µg/L
Chloromethane	5	1,200	µg/kg	5	µg/L
2-Chlorotoluene	5	160,000	µg/kg	5	µg/L
4-Chlorotoluene	5	NE	µg/kg	5	µg/L
cis-1,2-Dichloroethene	5	43,000	µg/kg	5	µg/L
cis-1,3-Dichloropropene	5	780	µg/kg	0.5	µg/L
Dibromochloromethane	5	1,100	µg/kg	5	µg/L
Diisopropyl ether	5	NE	µg/kg	5	µg/L
Ethylbenzene	5	8,900	µg/kg	5	µg/L
Hexachlorobutadiene	5	6,200	µg/kg	5	µg/L
n-Propylbenzene	5	240,000	µg/kg	5	µg/L
4-Isopropyltoluene	5	NE	µg/kg	5	µg/L
Naphthalene	5	56,000	µg/kg	5	µg/L
Isopropylbenzene	5	570,000	µg/kg	5	µg/L
Ethyl tert-butyl ether (ETBE)	5	NE	µg/kg	5	µg/L
Tert-amyl methyl ether (TAME)	5	NE	µg/kg	5	µg/L
Tert-butyl alcohol (TBA)	20	NE	µg/kg	20	µg/L
Methylene Chloride chloride	5	9100	µg/kg	5	µg/L
Styrene	5	1,700,000	µg/kg	5	µg/L
Trichloroethene (TCE)	5	53	µg/kg	5	µg/L
Tetrachloroethene (PCE)	5	1500	µg/kg	5	µg/L
Toluene	5	520,000	µg/kg	5	µg/L
trans-1,2-Dichloroethene	5	69,000	µg/kg	5	µg/L
trans-1,3-Dichloropropene	5	780	µg/kg	0.5	µg/L

Table 2-2, Cont.
Project Required Reporting Limits, EPA Method 8260B (Volatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
Vinyl chloride	5	79	µg/kg	0.5	µg/L
Xylenes, Total	5	270,000	µg/kg	5	µg/L

mg/kg = milligram per kilogram

µg/L = microgram per liter

Table 2-3
Project Required Reporting Limits, EPA Method 8270C
(Semivolatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
1,2,4-Trichlorobenzene	330	650,000	µg/kg	10	µg/L
1,2-Dichlorobenzene	330	370,000	µg/kg	10	µg/L
1,3-Dichlorobenzene	330	16,000	µg/kg	10	µg/L
1,4-Dichlorobenzene	330	3,400	µg/kg	10	µg/L
2,4,5-Trichlorophenol	1700	6,100,000	µg/kg	50	µg/L
2,4,6-Trichlorophenol	330	6,900	µg/kg	10	µg/L
2,4-Dichlorophenol	330	180,000	µg/kg	10	µg/L
2,4-Dimethylphenol	330	1,200,000	µg/kg	10	µg/L
2,4-Dinitrophenol	1700	120,000	µg/kg	50	µg/L
2,4-Dinitrotoluene	330	720	µg/kg	10	µg/L
2,6-Dinitrotoluene	330	720	µg/kg	10	µg/L
2-Chloronaphthalene	330	NE	µg/kg	10	µg/L
2-Chlorophenol	330	63,000	µg/kg	10	µg/L
2-Methylnaphthalene	330	NE	µg/kg	10	µg/L
2-Methylphenol	330	3,100,000	µg/kg	10	µg/L
2-Nitroaniline	1700	1,700	µg/kg	50	µg/L
2-Nitrophenol	330	NE	µg/kg	10	µg/L
3-3'-Dichlorobenzidine	660	1,100	µg/kg	20	µg/L
3-Nitroaniline	1700	NE	µg/kg	50	µg/L

Table 2-3, Cont.
Project Required Reporting Limits, EPA Method 8270C
(Semivolatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
4,6-Dinitro-2-methylphenol	330	NE	µg/kg	10	µg/L
4-Bromophenyl phenyl ether	330	NE	µg/kg	10	µg/L
4-Chloro-3-Methylphenol	330	NE	µg/kg	10	µg/L
4-Chloroaniline	330	240,000	µg/kg	10	µg/L
4-Chlorophenyl phenyl ether	330	NE	µg/kg	10	µg/L
4-Methylphenol	330	310,000	µg/kg	10	µg/L
4-Nitroaniline	1700	NE	µg/kg	10	µg/L
4-Nitrophenol	1700	NE	µg/kg	10	µg/L
Acenaphthene	330	3,700,000	µg/kg	10	µg/L
Acenaphthylene	330	NE	µg/kg	10	µg/L
Anthracene	330	22,000,000	µg/kg	10	µg/L
Benzo(a)anthracene	330	620	µg/kg	10	µg/L
Benzo(a)pyrene	33[a]	62	µg/kg	10	µg/L
Benzo(b)fluoranthene	330	620	µg/kg	10	µg/L
Benzo(ghi)perylene	330	NE	µg/kg	10	µg/L
Benzo(k)fluoranthene	330	380	µg/kg	10	µg/L
Butyl benzyl phthalate	330	12,000,000	µg/kg	10	µg/L
Chrysene	330	3,800	µg/kg	10	µg/L
Dibenzo(a,h)anthracene	33[b]	62	µg/kg	10	µg/L
Dibenzofuran	330	290,000	µg/kg	10	µg/L

Table 2-3, Cont.
Project Required Reporting Limits, EPA Method 8270C
(Semivolatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
Diethyl phthalate	330	49,000,000	µg/kg	10	µg/L
Dimethyl phthalate	330	100,000,000	µg/kg	10	µg/L
Fluoranthene	330	2,300,000	µg/kg	10	µg/L
Fluorene	330	2,700,000	µg/kg	10	µg/L
Hexachlorobenzene	33[b]	300	µg/kg	10	µg/L
Hexachlorobutadiene	330	6,200	µg/kg	10	µg/L
Hexachlorocyclopentadiene	330	370,000	µg/kg	10	µg/L
Hexachloroethane	330	35,000	µg/kg	10	µg/L
Indeno(1,2,3-cd)pyrene	33[b]	620	µg/kg	10	µg/kg
Naphthalene	330	56,000	µg/kg	10	µg/L
Nitrobenzene	330	20,000	µg/kg	10	µg/L
Pentachlorophenol	1700	3,000	µg/kg	50	µg/L
Phenanthrene	330	NE	µg/kg	10	µg/L
Phenol	330	37,000,000	µg/kg	10	µg/L
Pyrene	330	2,300,000	µg/kg	10	µg/L
bis(2-Chloroethoxy)methane	330	NE	µg/kg	10	µg/L
bis(2-Chloroethyl)ether	33[b]	210	µg/kg	10	µg/L
bis(2-Chloroisopropyl)ether	330	2,900	µg/kg	10	µg/L
bis(2-Ethylhexyl)phthalate	330	35,000	µg/kg	10	µg/L

Table 2-3, Cont.
Project Required Reporting Limits, EPA Method 8270C
(Semivolatile Organic Compounds)

Compound Name	Soil			Water	
	RL	Residential PRGs (EPA, 2002)	Unit	RL	Unit
di-n-Butyl phthalate	330	NE	µg/kg	10	µg/L
di-n-Octyl phthalate	330	2,400,000	µg/kg	10	µg/L
n-Nitroso-di-n-propylamine	33 [b]	69	µg/kg	10	µg/L
n-Nitrosodiphenylamine	330	99,000	µg/kg	10	µg/L

[b] *Selected Ion Monitoring (SIM) EPA 8270C*

mg/kg - milligram per kilogram
µg/L = microgram per liter

Table 2-4
Project Required Reporting Limits, EPA Methods 8081A and 8082 (Organochlorine Pesticides/PCBs)

Compound Name	Soil			Water	
	RL	Residential PRG (EPA, 2002)	Unit	RL	Unit
alpha-BHC	0.019	0.090	mg/kg	0.35	µg/L
beta-BHC	0.033	0.32	mg/kg	0.23	µg/L
delta-BHC	0.011	NE	mg/kg	0.24	µg/L
gamma-BHC (Lindane)	0.02	0.44	mg/kg	0.25	µg/L
Heptachlor	0.02	0.11	mg/kg	0.40	µg/L
Aldrin	0.022	0.029	mg/kg	0.34	µg/L
Heptachlor Epoxide	0.021	0.053	mg/kg	0.32	µg/L
Endosulfan I	0.021	370	mg/kg	0.30	µg/L
Dieldrin	0.035	0.030	mg/kg	0.44	µg/L
4,4'-DDE	0.025	1.7	mg/kg	0.58	µg/L
Endrin	0.036	18	mg/kg	0.39	µg/L
Endosulfan II	0.024	NE	mg/kg	0.40	µg/L
4,4'-DDD	0.042	2.4	mg/kg	0.50	µg/L
Endosulfan Sulfate	0.036	NE	mg/kg	0.35	µg/L
4,4'-DDT	0.036	1.7	mg/kg	0.81	µg/L
Endrin Ketone	0.036	NE	mg/kg	0.39	µg/L
Methoxychlor	0.057	300	mg/kg	0.86	µg/L
Endrin Aldehyde	0.016	NE	mg/kg	0.50	µg/L
Chlordane (alpha, gamma isomers)	0.015	NE	mg/kg	0.37	µg/L
Toxaphene	0.57	44	mg/kg	0.50	µg/L

mg/kg = milligram per kilogram
µg/L = microgram per liter

Table 2-5
Project Required Reporting Limits, Metal Analyses

Compound Name	Soil				Water	
	RL	Residential PRGs (EPA, 2002)	Background	Unit	RL	Unit
Aluminum (Al)	50	76,000	14,800	mg/kg	200	µg/L
Antimony (Sb)	1	31	3 06	mg/kg	50	µg/L
Arsenic (As)	0 2	0 39	6 86	mg/kg	50	µg/L
Barium (Ba)	10	5,400	173	mg/kg	100	µg/L
Beryllium (Be)	0 5	150	0.669	mg/kg	5.0	µg/L
Cadmium (Cd)	0.5	1.7	2 35	mg/kg	10	µg/L
Calcium (Ca)	100	NE	46,000	mg/kg	500	µg/L
Chromium (Cr)	5.0	210	26 9	mg/kg	10	µg/L
Cobalt (Co)	5.0	900	6 98	mg/kg	10	µg/L
Copper (Cu)	5 0	3100	10 50	mg/kg	10	µg/L
Iron (Fe)	10	23,000	18,400	mg/kg	100	µg/L
Lead (Pb)	1.0	150	15.1	mg/kg	10	µg/L
Magnesium (Mg)	50	NE	8,370	mg/kg	500	µg/L
Manganese (Mn)	2 0	1,800	291	mg/kg	10	µg/L
Molybdenum (Mo)	5 0	390	NE	mg/kg	50	µg/L
Nickel (Ni)	5 0	1,600	15 3	mg/kg	20	µg/L
Potassium (K)	500	NE	4,890	mg/kg	500	µg/L
Selenium (SE)	5 0	390	0 32	mg/kg	20	µg/L
Silver (AG)	1.0	390	0 539	mg/kg	10	µg/L
Sodium (NA)	100	NE	405	mg/kg	500	µg/L
Thallium (TL)	1 0	5 2	0.42	mg/kg	10	µg/L
Vanadium (V)	5 0	550	71 8	mg/kg	50	µg/L

Table 2-5, Cont.
Project Required Reporting Limits, Metal Analyses

Compound Name	Soil				Water	
	RL	Residential PRGs (EPA, 2002)	Background	Unit	RL	Unit
Zinc (ZN)	2 0	23,000	77 9	mg/kg	20	µg/L
EPA 7471A/7472 (Cold Vapor Technique)						
Mercury (Hg)	0 2	NE	0 22	mg/kg	0 02	µg/L

mg/kg = milligram per kilogram
µg/L = microgram per liter

Table 2-6
Project Required Reporting Limits, EPA TO-14 and EPA Method TO-3
(Volatile Organic Compounds)

Compound Name	Vapor, Part Per Billion-Volume
1,1,1-Trichloroethane	1
1,1,2,2-Tetrachloroethane	1
1,1,2-Trichloroethane	1
1,1-Dichloroethane	1
1,1-Dichloroethene	1
1,2-Dichloroethane	1
1,2-Dichloropropane	1
2-Butanone	5
2-Hexanone	5
4-Methyl-2-Pentanone	5
Acetone	5
Benzene	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon Tetrachloride	1
Chlorobenzene	1
Chloroethane	1
Chloroform	1
Chloromethane	1
Cis-1,2-Dichloroethene	1
Cis-1,3-Dichloropropene	1
Dibromochloromethane	1
Ethylbenzene	1
Methylene Chloride	1
Methyl-tert-butyl-ether	1
Styrene	1
Tetrachloroethene	1
Toluene	1
Trans-1,2-Dichloroethene	1
Trans-1,3-Dichloroethene	1
Trichloroethene	1
Vinyl Acetate	1

Table 2-6, Cont.
Project Required Reporting Limits, EPA TO-14 and EPA Method TO-3
(Volatile Organic Compounds)

Compound Name	Vapor, Part Per Billion-Volume
Vinyl chloride	1
Xylenes (Total)	1
Total volatile petroleum hydrocarbons[a]	100

[a]*Determined by EPA Method TO-3*

TABLE 4-1
WASTE CLASSIFICATION CRITERIA

Parameter		Method[a]	Regulatory Threshold Limit		
			CA Hazardous Waste (mg/kg) (TTLC)	CA Hazardous Waste (mg/L) (STLC)	RCRA Hazardous Waste (mg/L) (TCLP)
TPH		EPA Modified Method 8015	TBD	TBD	TBD
Metals	Antimony	EPA Method 6010	500	15	NA
	Arsenic	EPA Method 6010	500	5	5
	Barium	EPA Method 6010	10,000[b]	100	100
	Beryllium	EPA Method 6010	75	0.75	NA
	Cadmium	EPA Method 6010	100	1	1
	Chromium	EPA Method 6010	2,500	5	5
	Cobalt	EPA Method 6010	8,000	80	NA
	Copper	EPA Method 6010	2,500	25	NA
	Lead	EPA Method 6010	1,000	5	5
	Mercury	EPA Method 6010	20	0.2	0.2
	Molybdenum	EPA Method 6010	3,500	350	NA
	Nickel	EPA Method 6010	2,000		NA
	Selenium	EPA Method 6010	100	1	1
	Silver	EPA Method 6010	500	5	5
	Thallium	EPA Method 6010	700	7	NA
	Vanadium	EPA Method 6010	2,400	24	NA
	Zinc	EPA Method 6010	5,000	250	NA
VOCs	Benzene	EPA Method 8260B	NA	NA	0.5
	Carbon Tetrachloride	EPA Method 8260B	NA	NA	0.5
	Chlorobenzene	EPA Method 8260B	NA	NA	100
	Chloroform	EPA Method 8260B	NA	NA	6
	1,4-dichlorobenzene	EPA Method 8260B	NA	NA	7.5
	1,2-dichlorobenzene	EPA Method 8260B	NA	NA	0.5
	1,1-dichloroethene	EPA Method 8260B	NA	NA	0.7
	Hexachloroethane	EPA Method 8260B	NA	NA	3
	Methyl ethyl ketone	EPA Method 8260B	NA	NA	200
	Tetrachloroethene	EPA Method 8260B	NA	NA	0.7
	Trichloroethene	EPA Method 8260B	2,040	204	0.5
	Vinyl chloride	EPA Method 8260B	NA	NA	0.2
Ignitability (for liquids only, direct analysis)		EPA Method 1010	< 60°C	< 60°C	< 60°C

Explanation:
a – Test Methods for Evaluating Solid Waste Physical Methods SW-846 (EPA. 1994c)
NA – not applicable

mg/kg – milligrams per kilogram
mg/L – milligrams per liter
RCRA – Resource Conservation and Recovery Act
TBD – To be determined by the individual waste facility
TCLP –Toxicity Characteristic Leaching Procedure
TPH - total petroleum hydrocarbons
TTLC – Total Threshold Limit Concentration
STLC – Soluble Threshold Limit Concentration
VOC – volatile organic compound
°C – degrees Celsius
< - less than

Table 4-2
Sample Containers, Preservatives, and Holding Times

Analytes	Method	Container	Preservative	Holding Time
Soil				
TPH-extractable	EPA 8015 modified	one 6"x2" brass sleeve or one 4 oz glass jar	Cool at 4±2°C	14 days
TPH-purgeable	EPA 8015 modified	three Encore samplers or equivalent	Cool at 4±2°C	2 days until preserved, then 14 days from sample collection
VOCs	EPA 5035/8260B	three Encore samplers or equivalent	Cool at 4±2°C	2 days until preserved, then 14 days from sample collection
SVOCs & SIM	EPA 8270C	one 6"x2" brass sleeve or one 4 oz glass jar	Cool at 4±2°C	14 days
Pesticides	EPA 8081A	one 6"x2" brass sleeve or one 8 oz glass jar	Cool at 4±2°C	14 days
Metals	EPA 6010B/7000	one 6"x2" brass sleeve or one 8 oz glass jar	Cool at 4±2°C	6 months, except 28 days for mercury
Water				
TPH (extractable)	EPA Method 8015 modified	amber glass, 1 L	Cool at 4±2°C	7 days
TPH (purgeable)	EPA Method 8015 modified	glass VOA vials, 3 x 40 ml	Cool at 4±2°C and HCl to pH < 2	14 days
VOCs	EPA Method 8260B	glass VOA vials, 3 x 40 ml	Cool at 4±2°C and HCl to pH < 2	14 days
Metals (Title 22)	EPA 6010B/7000	HDPE 500 ml	Cool at 4±2°C and HNO_3 to pH<2	6 months, except 28 days for mercury
Vapor				
TPH (purgeable)	EPA TO-3	Tedlar Bags	None	72 hours
VOCs	EPA TO-15	SUMMA™ Canisters	None	14 days

CA LUFT – California leaking underground fuel tank
EPA – U.S. Environmental Protection Agency
HCl – hydrochloric acid
HNO_3 – nitric acid
L – liter
mL - milliliter
Oz – ounce
PCBs – polychlorinated biphenyl
SIM – selected ion monitoring for semivolatiles
SVOCs – semivolatile organic compounds
TPH – total petroleum hydrocarbons
VOA – volatile organic analysis
VOCs – volatile organic compounds

Table 9-1
Calibration Requirements, Quality Control Procedures, and Corrective Actions for Gas Chromatography Methods 8015B and 8081A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for target analytes	Initial calibration prior to sample analysis	Target analyte CF or RF RSD less than or equal to 20%[a] Mean CF or RF RSD less than or equal to 20%[a]	Correct problem, then repeat initial calibration
Second-source calibration verification	Once per five-point initial calibration	Less than 20% difference for most target analytes, 25% for difficult compounds	Correct problem, then repeat initial calibration
Daily calibration verification	Before sample analysis and every 10 samples or every 12 hours, as specified by the method	Less than 15% difference for all target analytes	Correct problem, then repeat initial calibration.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per method requirements	Recalculate results, locate and fix the problem, then rerun demonstration of those analytes that did not meet acceptance criteria.
Retention time window study	Establish initially, verify during daily calibrations	Within ±3 standard deviations of each analyte retention time from the initial study	Correct problem, then reevaluate analyte identification.
8081A: DDT and Endrin breakdown check	Daily prior to analysis of samples and every 10 samples	Degradation ≤15%	Clean the system, then repeat breakdown check
Internal standards (optional)	Every sample, spiked sample, standard, and method blank	Laboratory established QC acceptance criteria	Correct problem, then reextract and reanalyze affected samples.
Method blank	One per analytical batch (VOCs) and one per preparation batch (SVOCs)	No analytes detected above the RL	Correct problem, then reextract and reanalyze method blank and all samples processed with the contaminated blank.
MS/MSD	One MS/MSD pair per analytical/preparation batch	Advisory recovery limits: 70% to 130%	Identify problem; if not related to matrix interference, reextract and reanalyze MS/MSD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD pair per analytical/preparation batch	Advisory recovery limits: 70% to 130%	Correct problem, then reextract and reanalyze the LCS and all associated batch samples.

Table 9-2
Calibration Requirements, Quality Control Procedures, and Corrective Actions for EPA Methods 8260B and 8270C

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for target analytes	Initial calibration prior to sample analysis	8260B: The minimum average SPCC RF is 0 1 for chloromethane, 1,1-dichloroethane, and bromoform and 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane 8270C: The minimum average SPCC RF is 0.050 8260B and 8270C: RSD is less than or equal to 15% for target analytes and is less than or equal to 30% for CCC[a]	Correct problem, then repeat initial calibration.
Second-source calibration verification	Once per five-point initial calibration	Less than 25% difference for all target analytes and CCCs	Correct problem, then repeat initial calibration.
Daily calibration verification	Before sample analysis and every 12 hours of analysis time	Less than 20% difference for all target analytes and CCCs	Correct problem, then repeat initial calibration.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per method requirements	Recalculate results, locate and fix the problem, then rerun demonstration of those analytes that did not meet acceptance criteria
Check of mass spectral ion intensities (tuning procedure) using BFB (8260B) and DFTPP (8270C)	Prior to initial calibration and calibration verification	Must meet the method requirements before samples are analyzed	Retune instrument and verify the tune acceptability
Internal standards	During acquisition of calibration standard, samples, and QC check samples	Areas within -50% to +100% of last calibration verification (12 hours) for each	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.
Method blank	One per analytical batch (8260B) and one per preparation batch (8270C)	No analytes detected above the RL	Correct problem, then reextract and reanalyze method blank and all samples processed with the contaminated blank.
MS/MSD	One MS/MSD per analytical/preparation batch	Advisory recovery limits: 70% to 130% or laboratory statistically derived control limits	Identify problem; if not related to matrix interference, reextract and reanalyze MS/MSD and all associated batch samples.

Table 9-2, Cont.
Calibration Requirements, Quality Control Procedures, and Corrective Actions for EPA Methods 8260B and 8270C

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD per analytical/preparation batch	Advisory recovery limits: 70% to 130% or laboratory statistically derived control limits	Correct problem, then reextract and reanalyze the LCS (LCS/ LCD) and all associated batch samples.
Surrogate standards	Every sample, spiked sample, standard, and method blank	Advisory acceptance criteria per method requirements or laboratory statistically derived control limits	Correct problem, then reextract and reanalyze all affected samples.
MDL study	Once per 12-month period	Detection limits established will be below the RLs	Correct problem, then repeat the MDL study.

**If RSD for any analyte is >15%, regression fit may be used for the calibration curve for that analyte Acceptance criterion for first-order regression is $r^2 \geq 0.99$*

BFB – bromofluorobenzene
CCC – calibration check compounds
DFTPP – decafluorotriphenylphosphine
EPA – U.S. Environmental Protection Agency
GC – gas chromatograph
LCS/LCD – laboratory control sample/laboratory control duplicate
MDL – method detection limit
MS/MSD – matrix spike/matrix spike duplicate
QC – quality control
RF – response factor
RL – reporting limit
RSD – relative standard deviation

Table 9-3
Calibration Requirements, Quality Control Procedures, and Corrective Actions for EPA Method 6010B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial calibration (IC) per manufacturer's instructions, with a minimum of one standard and a calibration blank	Initial calibration prior to sample analysis	Accepted if the initial calibration verification (ICV) passes	Correct problem, then repeat initial calibration.
Second-source ICV, prepared at the calibration midpoint	Once per initial calibration	Less than 10% difference from IC for all target analytes	Correct problem, then repeat initial calibration.
Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence	Less than 10% difference from IC for all target analytes; #%5 RSD for a minimum of two integrations	Correct problem, then repeat initial calibration.
Calibration blank	After IC, before CCV calibration, after every 10 samples, and at the end of the sequence	All target analytes are within three times the IDLs	Reprepare and reanalyze the blank, then recalibrate the instrument.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per method requirements	Recalculate results, locate and fix the problem, then rerun demonstration of those analytes that did not meet acceptance criteria.
IDL study	Once per 12-month period	IDLs will be below the MDLs	Correct problem, then repeat the IDL study.
MDL study (water only)	Once per 12-month period	MDLs will be below the RLs	Correct problem, then repeat the MDL study.
Method blank	One per digestion batch	No analytes detected above the RLs	Correct problem, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank.
Interference check solution (ICS)	At the beginning of an analytical run	Within ±20% of expected value	Terminate analysis, correct problem, then reanalyze ICS and all affected samples.
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria: 75% to 125% accuracy, 20% precision	Identify problem, then reprepare and reanalyze the MS/MSD pair and all samples in the associated batch.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD pair per each preparation batch	QC acceptance criteria: 75% to 125% accuracy, 20% precision	Terminate analysis, identify and correct the problem, then reprepare and reanalyze all affected samples and QC checks.

Table 9-3, Cont.
Calibration Requirements, Quality Control Procedures, and Corrective Actions for EPA Method 6010B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Dilution test	Each new sample matrix	1:5 dilution must agree within ±10% of the original determination	Perform postdigestion spike addition
Method of standard addition (MSA), single or multilevel	When interferences are suspected and for new sample matrix	Linearity of a multilevel MSA	Correct problem, then repeat MSA.
Postdigestion spike addition	When dilution test fails	Recovery within 75% to 125% of expected results	Correct problem, then reanalyze postdigestion spike addition.

CCV – continuing calibration verification
EPA – U S Environmental Protection Agency
IC – initial calibration
ICS – interference check solution
ICV – initial calibration verification
IDL – instrument detection limit
LCS/LCD – laboratory control sample/laboratory control duplicate
MDL – method detection limit
MS/MSD – matrix spike/matrix spike duplicate
MSA – method of standard addition
QC – quality control
RL – reporting limit
RSD – relative standard deviation

Table 9-4
Calibration Requirements, Quality Control Procedures, and Corrective Actions for EPA Method 7000A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial multipoint calibration (IC), with a minimum of three standards and one calibration blank	Initial calibration prior to sample analysis	Correlation coefficient >0.995; accepted if the initial calibration verification (ICV) passes	Correct problem, then repeat initial calibration
Second-source ICV, prepared at the calibration midpoint	Once per initial calibration	Less than 10% difference from IC for all target analytes	Correct problem, then repeat initial calibration
Continuing calibration verification (CCV), same source as IC	After every 10 samples and at the end of the sequence	Less than 20% difference from IC for all target analytes	Correct problem, then reanalyze previous 10 samples.
Calibration blank	After IC, before CCV calibration, after every 10 samples, and at the end of the sequence	All target analytes not detected above the PQLs	Reprepare and reanalyze the blank, then recalibrate the instrument.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample	Once	QC acceptance criteria per method requirements	Recalculate results, locate and fix the problem, then rerun demonstration of those analytes that did not meet acceptance criteria.
MDL study (water only)	Once per 12-month period	MDLs will be below the PQLs	Correct problem, then repeat the MDL study.
Method blank	One per digestion batch	No analytes detected above the PQLs	Correct problem, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank.
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria: 80% to 120% accuracy, 20% precision	Identify problem; if not related to matrix interference, reextract and reanalyze MS/MSD and all associated batch samples.
LCS or LCS/LCD pair if there is not enough sample for MS/MSD	One LCS or LCS/LCD pair per preparation batch	QC acceptance criteria: 80% to 120% accuracy, 20% precision	Correct problem, then redigest and reanalyze LCS/LCD pair and the affected batch.
Dilution test	One sample per batch	1:5 dilution must agree within ±10% of the original determination	Perform postdigestion spike addition.
Postdigestion spike addition (recovery test)	When dilution test fails	Recovery within 85% to 115% of expected results	Conduct MSA test

Table 9-4, Cont.
Calibration Requirements, Quality Control Procedures, and Corrective Actions for EPA Method 7000A

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Method of standard addition (MSA), single or multilevel	When postdigestion spike addition fails	Linearity of a multilevel MSA	Correct problem, then repeat MSA.

CCV – continuing calibration verification
EPA – U.S. Environmental Protection Agency
IC – initial calibration
ICV – initial calibration verification
LCS/LCD – laboratory control sample/laboratory control duplicate
MDL – method detection limit
MS/MSD – matrix spike/matrix spike duplicate
MSA – method of standard addition
PQL – practical quantitation limit
QC – quality control

Table 11-1
Gas Chromatography/Mass Spectrometry Data Deliverables Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC/MS	Case narrative		X	X	X
	Corrective action report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-custody form, cooler receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample[a]	I	X	X	X
	Tentatively identified compounds (TICs) for each sample (10 peaks)	I,TIC	X		
	Laboratory control sample/laboratory control duplicate report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference [RPD], and RPD acceptance limits)	III (modified)	X	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix spike/matrix spike duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X	X
	Instrument performance check (tuning) report	V	X	X	
	Initial calibration data (including acceptance limits)	VI	X	X (summary only)	
	Continuing calibration data (including acceptance limits)	VII	X	X (summary only)	
	Internal standard areas and retention time reports (including acceptance limits and out-of-control flags)	VIII	X	X	
	Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard		X		
	Instrument quantitation report		X		
	Raw and background subtracted mass spectra for each target analyte found		X		

Table 11-1, Cont.
Gas Chromatography/Mass Spectrometry Data Deliverables Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC/MS (Cont)	Mass spectra of tentatively identified compounds with library spectra of five best-fit matches		X		
	Sample preparation bench sheets		X	X	
	Gel permeation chromatography cleanup logs		X		
	Method blank summary	IV	X		
	Standard preparation logs		X	X	
	Analysis run logs	VIII	X	X	
	Percent moisture		X	X	X
	Ph		X[b]		

[a]*Must include field sample ID, laboratory ID, date/time sampled, date received extracted/analyzed, practical quantitation limit method detection limit dilution factor(s) results comments, and approval signature/date*

[b]*For volatile analysis of water samples only*

CLP – Contract Laboratory Program
EPA – U S Environmental Protection Agency
QC – quality control
SDG – sample delivery group

Table 11-2
GC or HPLC Data Deliverables Package Requirements

GC/HPLC	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC or HPLC	Case narrative		X	X	X
	Corrective action report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-custody form, cooler receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample[a]	I	X	X	X
	Laboratory control sample/laboratory control duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III (modified)	X	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix spike/matrix spike duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X	X
	Initial calibration data for each column (indicate which column was used for quantitation)	VI	X	X (summary only)	
	Continuing calibration data (indicate which column was used for quantitation) and calibration verification data	VII	X	X (summary only)	
	Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards		X		
	Instrument quantitation report		X		
	Method blank summary	IV	X		
	Pesticide identification summary	X	X		
	Sample preparation bench sheets		X	X	
	Gel permeation chromatography cleanup logs		X		

Table 11-2, Cont.
GC or HPLC Data Deliverables Package Requirements

GC/HPLC	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Organic Analysis by GC or HPLC (Cont.)	Standard preparation logs		X	X	
	Analysis run logs	VIII	X	X	
	Percent moisture		X	X	X

[a]*Must include field sample ID laboratory ID, date/time sampled, date received, extracted/analyzed, practical quantitation limit, method detection limit, dilution factor(s) comments, and approval signature/date Results from the primary and secondary columns/detector shall be reported*

CLP – Contract Laboratory Program
EPA – U.S Environmental Protection Agency
GC – gas chromatography
HPLC – high-performance liquid chromatography
QC – quality control
SDG – sample delivery group

Table 11-3
Metals Data Deliverables Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Metals Analysis	Case narrative		X	X	X
	Corrective action report(s)		X	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X	X
	Chain-of-custody form, cooler receipt form		X	X	X
	Sample log-in sheet	DC-1	X		
	Complete SDG file inventory sheet	DC-2-1	X		
	Data summary for each blank and sample[a]	I-IN	X	X	X
	Laboratory control sample/laboratory control duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	X	X	X
	Matrix spike/matrix spike duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	V (Part 1)-IN	X	X	X
	Postdigestion spike recovery	V (Part 2)-IN	X	X	X
	Duplicate sample report	VI-IN	X	X	X
	Blank results	III-IN	X	X	X
	Initial and continuing calibration data	II (PART I)-IN	X	X	
	Inductively coupled plasma (ICP) interference check sample report	IV-IN	X	X	
	Standard addition results	VIII-IN	X	X	
	ICP serial dilution results	IX-IN	X		
	Preparation logs	XIII-IN	X	X	
	Analysis run logs	XIV-IN	X	X	
	Standard preparation logs		X	X	
	Contract-required detection limit standard report	II (Part 2)-IN	X		
	Instrument detection limits	X-IN	X		
	ICP interelement correction factors	XI-IN	X	X	

Table 11-3, Cont.
Metals Data Deliverables Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	CLP or CLP-like Package, Level IV	SW-846 Package, Level III	Standard Laboratory Report
Metals Analysis (Cont.)	Data and instrument printouts		X		
	Percent moisture		X	X	X
	pH		X[b]		

[a]*Must include field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, practical quantitation limit method detection limit, dilution factor(s) results, comments, and approval signature/date*

[b]*For water samples only.*

CLP – Contract Laboratory Program
EPA – U.S. Environmental Protection Agency
QC – quality control
SDG – sample delivery group

TABLE 11-4
INORGANIC DATA DELIVERABLE PACKAGE REQUIREMENTS

Method	Deliverable Requirement	Equivalent EPA Form	Comprehensive Package (Level IV)	Definitive Package (Level III)
Inorganic Chemistry	Case narrative		x	x
	Corrective action report(s)		x	x
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		x	x
	Chain-of-Custody form, cooler receipt form		x	x
	Sample log-in sheet	DC-1	x	
	Complete SDG file inventory sheet	DC-2-1	x	
	Data summary for each blank and sample (1)	I-IN	x	x
	Laboratory Control Sample/Laboratory Control Duplicate (LCS/LCD) report (concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	x	x
	Matrix Spike (MS) report (concentration spiked, percent recovered, percent recovery acceptance limits)	V(PART1)-IN	x	x
	Duplicate sample report	VI-IN	x	x
	Calibrations, initial and verification	II(PART1)-IN	x	x
	Copies of sample preparation logs	XIII	x	x
	Copies of analysis run logs	XIV	x	x
	Raw data and instrument printouts		x	
	Copies of standard preparation logs		x	x
	Percent moisture		x	x

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, date extracted/analyzed, analytical results, dilution factors, MRLs, MDLs, comments, approval signature/date.

TABLE 11-5
DATA VALIDATION CRITERIA

Analytical Parameter Group	Cursory Data Validation Criteria (EPA Level III)	Full Data Validation Criteria (EPA Level IV)
Organic Analyses	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Compound identification Detection limits Compound quantitation Sample results verification Other laboratory QC specified by the method Overall assessment of data for an SDG
Inorganic and Physical Analyses	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample Field duplicate sample analysis Other laboratory QC specified by the method Detection limits Analyte identification Analyte quantitation Sample results verification Overall assessment of data for an SDG

ATTACHMENT 1

DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs)

Data quality objectives (DQOs) are qualitative and quantitative statements that clarify the project objectives, specify the most appropriate type of data for the project decisions, determine the most appropriate conditions from which to collect data, and specify tolerable limits on decision errors. DQOs are based on the end uses of the data and are determined through a seven-step process as described in QA/G-4 (EPA, 2000).

In addition to the project objectives, the DQOs specify data collection boundaries and limitations, the most appropriate type of data to collect, and the level of decision error that will be acceptable for the decision.

The DQO process is a series of planning steps based on scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used for decision-making are appropriate for the intended application. The DQO process, as defined by the EPA, consists of seven steps that are designed to provide a systematic approach to resolving issues that pertain to a site investigation and remediation (EPA, 2000).

2.1 Stating the Problem

Step 1. Identify the planning team members, including decision-makers; describe the problem; develop a conceptual model of the environmental hazard to be investigated; and determine resources such as budget, personnel, and schedule.

The planning team consists of representatives of the U.S. Navy and RMA, contractor for the Navy, with the participation of the Department of Toxic Substances Control (DTSC); and the California RWQCB, Santa Ana Region. The U.S. Navy is the decision-maker. The work will be conducted according to the Navy-approved budget and schedule.

2.1.1 Former TAAs 771 and 130C

Based on RCRA Facility Assessment (RFA) investigations by Jacobs Engineering and Bechtel National Inc., Shaw Environmental Inc., (Shaw) completed verification soil sampling as part of closure activities at former TAAs 771 and 130C. Based on verification soil sampling analytical data collected at 1.5 and 3 feet bgs and risk screening analysis, it was confirmed that arsenic (contributed to over 98% of risk) was detected above station background levels at both TAAs 771 and 130C. Excavations of subsurface contaminated soil need to be completed at both former TAAs 771 and 130C. Details on

the planned excavation area limits at both TAAs 771 and 130C are included in the Figures 4-1 and 4-2 of the SAP. Both TAAs are inactive, so the source of contamination has been removed at both TAAs 771 and 130C. The nature and extent of contamination (as shown in Figures 4-1 to 4-3) has been defined sufficiently, but after removal of contaminated soil, confirmation soil samples need to be collected from the bottom and wall of the excavations to show residential risk of 1×10^{-6} as part of site closure.

2.1.2 MSC P1 Unit 2, Former Building 493

Based on previous investigations by OHM, shallow subsurface soils within the top 4 feet near OHM Hand Auger Boring HA-04 at former Building 493, a former pesticide storage area is impacted with pesticides and poses a risk to human health and the environment. MSC P1 Unit 2, former Building 493 pesticide storage area, is inactive so the source of contamination has been removed. In 1999, OHM completed verification activities at the former pesticide storage area near Building 493 by advancing 8 soil borings and collecting 25 soil samples. The vertical and lateral extent of the contamination has been defined. Excavation of subsurface contaminated soil near HA-04 needs to be completed. Details on the planned excavation area limits at former Building 493 are included in the Figure 4-3 of the SAP. Confirmation soil samples need to be collected in order to assess the extent of impacted soil or to determine if the impacted soil has been removed and to show residential risk of 1×10^{-6} as part of site closure.

2.2 Identifying the Decisions

Step 2. Identify the principal study question, define alternative decisions, develop a decision statement, and organize multiple decisions.

The principal study questions at former TAAs 771 and 130C and MSC P1 Unit 2 Building 493 sites are:

- Has the shallow subsurface soil at TAAs 771 and 130C and the MSC P1 sites, which pose a risk to human health been removed?
- Is the vertical and lateral extent of subsurface contamination defined based on the review of confirmation soil sample analytical data comparisons to EPA Region 9 residential Preliminary Remediation Goal and MCAS El Toro established background concentration for soil?
- Are these sites suitable for closure?

2.3 Identifying Inputs to the Decisions

Step 3. Identify the information needed, determine sources for this information, determine the basis for determining the action level, and identify sampling and analysis methods that can meet the data requirements.

The following factors will be considered in the decision-making process for TAAs 771, 130C and MSC P1 Unit 2 sites:

- Previous background data collected by Jacobs Engineering (JEG) 1993
- Bechtel National, Inc. (BNI), Information collected during RFA field activities 1996
- OHM Remediation Services (OHM) Analytical data from 1998 to 1999
- Shaw Environmental Inc (Shaw) Analytical Data from 1999-2002
- Analytical results of surrounding sites
- Site history
- Field observations (visual inspection of excavations for dark abnormal stains, any odor) and field measurements (abnormal high PID readings)
- EPA Region 9 Preliminary Remediation Goal (EPA, 2002)

2.4 Defining the Boundaries

Step 4. Define the target population of interest, specify the spatial and temporal boundaries, determine the time frame for collecting data and making decisions, and determine the practical constraints on collecting data.

2.4.1 Former TAAs 771, 130C and MSC P1 Unit 2 Former Building 493

Confirmation soil samples will be collected from each excavation at former TAAs 771, 130C and MSC P1 Unit 2 Building 493. Limits of Excavation and details are discussed in the Work Plan and SAP. Soil samples will be collected to confirm the removal of shallow subsurface contaminated soil that pose risk to human health at each site. The confirmation soil-sampling program at the former TAAs 771, 130C and MSC P1 Unit 2 will occur over a 2-week period.

2.5 Developing a Decision Rule

Step 5. Specify an appropriate population parameter (mean, median, percentile), confirm that the action level exceeds measurement detection limits, and develop a decision rule (if ... then statements).

2.5.1 Former TAAs 771, 130C and MSC P1 Unit 2 Former Building 493

- If during excavation activities, any stains or contamination is observed then the excavation will be expanded to remove the visually identified contaminated soil and appropriate samples will be collected.
- If the confirmation soil sampling data at a site show that there is no risk to human health or the environment based on the cleanup goals (comparisons of confirmation soil sampling data to EPA Region 9 residential PRGs and MCAS El Toro established background concentrations), then closure will be requested.

The project-required reporting limits are specified in this SAP.

2.6 Specifying Limits on Decision Error

Step 6. Determine the range of the parameter of interest, choose the null hypothesisd examine the consequences of making an incorrect decision, specify a range of values where the consequences are minor (gray region), and assign probability values to points above and below the action level that reflect tolerable probability for potential decision errors.

Statistically derived error limits cannot be established for this work. Sampling will be based on the judgment of field personnel. Samples will be collected from predetermined locations (at each wall and bottom of the excavations to confirm removal of shallow subsurface contaminated soils based on site requirements). For TAAs 771, 130C and MSC P1 Unit 2 Former Building 493, analytical results will be compared to agreed-upon action levels (i.e., Station background levels, or 2002 EPA Region 9 PRGs for residential land use). In order to specify limits on decision errors, a review of the past site operations and previous soil sampling analytical results will be performed. Based on the review of historical site-specific data, best professional judgment will be used to limit the possibility of sampling design errors.

Measurement errors may occur during sample collection, QC samples, sampling handling (e.g., high temperature), sample preparation or analysis in the laboratory, or data handling or reduction. Following proper standard operating procedures can eliminate many of these measurement errors.

The specific data types and their acceptable limits of measurement error for the TAA sites and MSC P1 excavation and confirmation sampling are as follows:

- Reproducibility of duplicate sample results: plus or minus 30% for soil.

- Equipment rinsates and field blanks: no detections of analytes.
- Trip blanks: no detections of VOCs.
- Laboratory QC recoveries: within method-specific ranges.

These data will be evaluated during the data evaluation process.

2.7 Optimizing the Design for Obtaining Data

Step 7. Review the DQO outputs, develop data collection design alternatives, formulate mathematical expressions for each design, select sample size that satisfies the DQOs, decide on the most resource-effective design or agreed alternative, and document details in the SAP.

2.7.1 Former TAAs 771, 130C and MSC P1 Unit 2 Former Building 493

Figures 4-1 through 4-3 and Table 1-3 of the SAP provide sampling design and protocols for former TAAs 771, 130C and MSC P1 Unit 2 Building 493 sites. All three sites focus on previously surveyed or sampled data where results indicated the need for future remedial action (based on the Shaw report, Shaw 2004). Soil sampling, based on the previous findings, will be followed by excavation and confirmation sampling as outlined in the Work Plan (Section 6.0) and SAP (Section 4.0). The methodology described seeks to test the worst-case samples to conservatively estimate the impact of contamination at the site. After the contaminated soil has been excavated, confirmation samples (from four sidewalls and the excavation floor, as deemed necessary) will be collected. Excavation soil sample locations focus on visual observation of the site and stains. Soil that exceeds the cleanup goals will be evaluated and removed to meet cleanup goals prior to site closure (residential PRGs).

ATTACHMENT 2

ENCORE SAMPLER PROCEDURE

STANDARD OPERATING PROCEDURE

Soil Sampling with Encore™ Sampler

1.0 Introduction

This Standard Operating Procedure (SOP) establishes the protocol for EnCore™ soil sampling according to EPA Method 5035 for volatile organic compound (VOC) analyses. RMA personnel will use this SOP for collection of soil and oily waste samples with low VOC concentrations as defined by the data quality objectives (DQOs). Low concentration samples are those ranging from 0.5 microgram/kilogram (µg/kg) to 200 µg/kg. Samples collected in EnCore™ samplers will be analyzed by gas chromatography methods (EPA Methods 8015B, 8021B) or gas chromatography/mass spectrometry (EPA Method 8260B). Sample introduction techniques will be purge and trap technique. Additional sample aliquots will be collected into empty containers for dry weight determination.

2.0 Definitions

2.1 EnCore™ Sampler

2.1.1 The EnCore™ sampler cartridge is a disposable volumetric sampling system designed to collect, store, and deliver soil samples hermetically. No chemical preservation of the sample is performed in the field. Extrusion and extraction of the soil is done in the laboratory. Since the sample is never exposed to the atmosphere after sampling, the loss of VOCs during sample transport, storage and analysis is negligible. The EnCore™ samplers come in two sizes for sample volumes of approximately 25 or 5 grams.

2.1.2 The associated device is the EnCore™ T-handle Sampling Tool, which is used with the EnCore™ cartridges.

2.1.3 The EnCore™ sampler is not designed to store solvent or free product. Soil conditions with heavy latent solvents may require different sampling techniques due to the potential interaction with the coring body.

2.2 Matrix Spike and Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) are quality control (QC) check samples that measure matrix-specific effects and method performance. A matrix spike sample is prepared at the laboratory by adding a known quantity of target analytes to a sample prior to sample digestion or extraction.

2.3 Field Duplicate

Field duplicates are samples collected at the same time from the same source. They are used to evaluate the sampling precision and the overall quality of sample collection.

3.0 Supplies and Reagents

Supplies and reagents are the instruments, chemicals and other materials necessary to perform analysis. The required list of supplies and reagents is as follows:

- EnCore™ sampler cartridge made by En Chem, Inc., 1795 Industrial Drive, Green Bay, WI 54302 or equivalent
- EnCore™ T-handle Sampling Tool made by En Chem, Inc., 1795 Industrial Drive, Green Bay, WI 54302 or equivalent
- Sample containers: pre-cleaned 40-milliliter (ml) vials with caps
- Plastic scoops, or stainless steel spatula, or wooden tongue depressors
- Chain of custody forms
- Disposable nitrile gloves
- Safety glasses
- Coolers for sample shipping
- Ice
- Packing material, such as absorbent pads
- Shipping tape
- Chain of custody seals
- Sample and shipping labels
- Paper towels or Kimwipes

4.0 Procedure

4.1 Responsibilities

4.1.1 The project QC Manager is responsible for monitoring the sampling activities, assuring that the requirements of this SOP are met, and complete documentation of sampling activities.

4.1.2 The Project Manager is responsible for ensuring that proper supplies, reagents, and adequate space are available for sampling activities; for assigning qualified and trained personnel for sampling; and for integrating sampling activities into the project schedule.

4.1.3 The Project Engineer is responsible for laboratory selection and coordination, identification and preparation of field supplies, sampling per this SOP requirements, field quality control, sample handling in the field and shipping to the laboratory, and training and documentation of other project staff in the use of this SOP.

4.2 EnCore™ Assembly

4.2.1 Prior to taking the sample, test the plunger for free movement by pushing the plunger rod down until it rests against the tabs.

4.2.2 The locking lever on the EnCore™ T-handle must be depressed as the cartridge is inserted, and the slots on the cartridge with the locking pins in the T-handle must be lined up. Take a cartridge out of the bag and save the bag for future use. Plunger end first, insert the cartridge into T-handle with locking tabs aligned, and twist the cartridge clockwise to lock it in place.

4.2.3 If faulty components are detected during assembling process, discard the cartridge and assemble the device with a new cartridge.

4.3 Field Sampling

4.3.1 Collect soil samples one at a time using grab soil sample collection methods as defined in the project SAP. These methods may include surface and shallow subsurface sampling, subsurface sampling while drilling, split spoon sampling, or any other sampling procedure as defined in the project SAP.

4.3.2 Wear disposable gloves and safety glasses during sample collection activities. Apply EnCore™ to freshly exposed surface soil or to one end of a sleeve core as soon as it is brought to the surface. Holding the device with the T-handle up and the cartridge down, insert the sampling device into the soil. Look down the viewing hole to make sure the plunger o-ring is visible indicating that the cartridge is full. If the o-ring is not visible, apply more pressure to fill up the cartridge. Withdraw sampling device from soil and wipe off excess dirt from cartridge body.

4.3.3 Cap the cartridge core while it is still on the T-handle. Push or twist cap on until the gloves are seated over the ridge of the coring body.

4.3.4 Remove the capped sampler by pushing the lock lever down on T-handle, and twisting and pulling the sampler from T-handle. Lock the plunger by rotating plunger rod until wings rest against the tabs. Attach the label and place the cartridge in the EnCore™ sample bag.

4.4.5 Collect three EnCore™ samples for each location. In addition, collect 10-20g of soil into a clean, labeled vial for dry weight determination.

4.3.6 Store the EnCore™ sampler bag in a cooler with ice until it can be delivered to the laboratory or packaged for shipment.

4.3.7 Using the above-described procedure, collect two additional samples for MS/MSD analysis. In addition to the field sample ID, clearly identify samples on the vial label as "MS" and "MSD".

4.3.8 Collect field duplicates as unhomogenized split samples obtained as two aliquots of the same soil in two EnCore™ sample cartridges.

4.3.9 During sampling, follow the chain of custody procedures as required by Project SAP.

4.3.10 Package the samples per SAP, enclose the chain of custody form and ship the sample coolers as required by SAP.

4.3.11 Soil samples will be shipped to the laboratory for analysis or preservation within the 48 hour holding time unless otherwise specified in the SAP. Preserved samples can be held up to 14 days for analysis. The laboratory will keep samples in a secure refrigerator at 4±2° until the time of analysis. Analytical procedures will be according to EPA Method 5035 and laboratory SOP.

5.0 Quality Control

Unless otherwise required in the project SAP, a MS/MSD pair will be collect at a frequency of one pair for every 20 samples, and field duplicates will be collected at a 10% frequency.

6.0 Corrective Action

Corrective action for problems with sample collection may include re-sampling, preparation of new vials with methanol, and other actions as appropriate. Corrective action will be documented according to SAP.

7.0 Records

Records generated as a result of implementation of this SOP will be controlled and maintained in the project record files.

8.0 References

- Test Methods for Evaluating Solid Waste, USEPA Office of Solid Waste, SW-846, Final Update III, December 1996
- USEPA Memorandum "Clarification Regarding Use of SW-846 Methods," August 7, 1998

ATTACHMENT 3

CHAIN-OF-CUSTUDY RECORD

CHAIN-OF-CUSTODY RECORD

10001

RMA LAND CONSTRUCTION
RMA Land Construction, Inc.
2707 Saturn St.
Brea, CA 92821
(714) 985-2888

Client:	Contact:	Tel #:	Fax #:
Address:	City:	State:	Zip Code:
Project Name/Code:			
Project Address:	Job #:	P.O. #:	
Project Manager:	PMs Phone:		
Due Date: ☐ regular ☐ rush: _____ days	Sample by:		

Analysis Items

White - With report
Yellow - Lab copy
Pink - Originator

Field Sample ID #:	Sample Description	Date Time Collected	Sample Matrix	Preser-vation	# of Containers	QC Level											Remarks

Sample Disposal: ☐ Return Disposal by ☐ Hold for____days after receiving date. **If not specified, samples will be discarded 45 days after samples are received.**

Sample Conditions: ☐ Intact; ☐ Broken. Temperature: ☐ Room ☐ Cold (_____°C)

Relinquished By	Date	Time	Received By	Date	Time

ATTACHMENT 4

CHAIN-OF-CUSTUDY SEAL

CUSTODY SEAL

Person Collecting Sample _____ Sample No. _____
(signature)

Date Collected _____ Time Collected _____

SITE HEALTH AND SAFETY PLAN

CLOSURE OF TEMPORARY ACCUMULATION AREAS 771, 130C AND MSC P1 UNIT 2, BUILDING 493 OTHER SITES

FORMER MARINE CORPS AIR STATION EL TORO, CALIFORNIA

August 2004

Prepared for:

Department of the Navy
Commander, Southwest Division
Naval Facilities Engineering Command
1230 Columbia Street
San Diego, CA 92101

Prepared by:

RMA Land Construction, Inc.
2707 Saturn Street
Brea, CA 92821

Prepared under:

Contract No. N68711-04-C-1010
RMA Project No. 04-224

HEALTH AND SAFETY PLAN

CLOSURE OF INACTIVE TEMPORARY ACCUMULATION AREAS AND OTHER SITES AT THE FORMER MARINE CORPS AIR STATION El TORO, CALIFORNIA

Contract No N68711-04-C-1010

Prepared by: Sean Moncrief 5/2/04
Date

Sean Moncrief
Project Engineer

Approved by: Steve Mohammad 5/2/04
Date

Steve Mohammad
Project Manager

Approved by: DM Sassoon 05/03/04
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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienist
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
Cal-OSHA	California Occupational Safety and Health Administration
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
CRC	contamination reduction corridor
CRZ	Contamination Reduction Zone
CO	Contract Officer
dBA	Decibels
EM	Engineering Manual
EPA	U.S Environmental Protection Agency
°F	(degrees) Fahrenheit
GAC	granular activated carbon
RMA	RMA, Land Construction Inc.
H&S	Health and Safety
HA	hazard analysis
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High-Efficiency Particulate Air
HR	heart rate
HSM	Health and Safety Manager
HSO	Health and Safety Officer
IDLH	Immediately Dangerous to Life and Health
KV	kilovolt
LEL	lower explosive limit
mg/m^3	milligrams per cubic meter
MCAS	Marine Corps Air Station
MSDS	Material Safety Data Sheet

LIST OF ACRONYMS AND ABBREVIATIONS

NFD	Naval Fuel Depot
NAVFAC	Navy Facilities Engineering Command
NIOSH	National Institute of Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
O_2	oxygen
OSHA	Occupational Health and Safety Administration
PGTP	Packaged Groundwater Treatment Plant
PID	photoionization detector
PPE:	Personal Protective Equipment
ppm	parts per million
QA/QC	quality assurance/quality control
SHSP	Site Health and Safety Plan
SOW	Scope of Work
STP	stormwater treatment plant
SWDIV	Southwest Division
TAA	Temporary Accumulation Area
TLVs	Threshold Limit Values
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UST	underground storage tank

1.0 INTRODUCTION

RMA Land Construction, Inc. (RMA) has prepared this Site Health and Safety Plan (SHSP) for the Naval Facilities Engineering Command (NAVFAC) Southwest Division (SWDIV) for the closure of inactive temporary accumulation areas and other sites at the former Marine Corps Air Station (MCAS) El Toro, California. The work is provided under Solicitation Number N68711-04-R-1002, Requisition Number 0914-04-400728.

1.1 Purpose and Objective

Adherence to applicable portions of federal, local, national consensus organization, and health and safety standards, regulations, and guidance manuals is required during field activities. These include, but may not be limited to, the following:

- United States Department of Labor OSHA Standards, specifically:
  - 29 CFR 1910.134: Respiratory Protection
  - 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response (HAZWOPER)
  - 29 CFR 1910.1200: Hazard Communication
  - 29 CFR 1926: Safety and Health Regulations for Construction
- State Regulations including Title 8 California Code of Regulations (CCR) and Title 24 CCR (Health and Safety Code)
- National Institute for Occupational Safety and Health (NIOSH)/OSHA/United States Coast Guard (USCG)/EPA, OSHA Guidance Manual for Hazardous Waste Site Activities, October 1985 (NIOSH/OSHA/USCG/EPA, 1985)
- United States Army Corps of Engineers (USACE), Safety and Health Requirements Manual, Engineering Manual (EM) 385-1-1, November 2003 (USACE, 2003)

This SHSP establishes the policies and procedures, which protect workers and the public from potential hazards posed by work at this site. RMA considers safety the highest priority during work at a site containing potentially hazardous materials and has established a policy of minimizing exposure, which must be upheld on all projects. Although the SHSP focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the RMA Superintendents and Health and Safety (H&S) Officials to take into account changing site conditions such as new data on chemical hazards, weather, and deviations to the scope of work.

Changes to the SHSP must be approved by the Health and Safety Officer (HSO), Health and Safety Manager (HSM), and Project Manager or Project Superintendent and recorded on the Site Health and Safety Plan Change Approval Form provided as Attachment 2 of this SHSP. The Project HSM will forward a copy of the SHSP Change Approval Form to the Navy.

This SHSP is written in accordance with Occupational Safety and Health Administration (OSHA) requirements contained in 29 Code of Federal Regulations (CFR) 1910.120. All project activities will be conducted in a manner that minimizes the probability of injury, accident or incident occurrence. All RMA employees, subcontractors, and visitors are required to read and sign the SHSP prior to site entry. The Site Health and Safety Plan Acknowledgment Form is included as Attachment 2.

1.2 Health and Safety Policy

It is the policy of RMA to provide a safe and healthful workplace for all of its employees. Injury, illness and property damage, interfere with the regular operation of business, negatively impact projects, efficiency, as well as the reputation and profitability of the entire corporation.

RMA intends to meet or exceed all applicable federal, state and local health and safety regulatory requirements. RMA recognizes the required commitment of resources and will provide the resources.

All employees are required to comply with the implementation of the Health and Safety Program, to accept the responsibilities appropriate to their position, and to properly use all health and safety related materials and equipment provided.

Failure of any employee to follow the requirements of the health and Safety Program and site specific safety plans described herein is a cause for disciplinary action, up to and including discharge.

1.3 Site Location and Background

Former MCAS El Toro is located in southern California approximately 45 miles southeast of Los Angeles in Orange County. The Station is approximately 1 mile north of the intersection of Interstates 5 and 405, and covers approximately 4,700 acres (Figure 1-1). Former TAAs, MSC P1 Unit 2, former UST sites and MSC JP5 inactive pipeline unit locations are shown in Figure 1-2. Detailed background information on Former TAAs 771, 130C and MSC P1 Unit 2, Building 493 is described in Section 2 of Work Plan.

1.3 Objectives

The objectives at the former TAA 771, 130C and MSC P1 Unit 2 sites are to remove very near surface and subsurface contaminated soils identified by previous investigations, perform confirmation soil sampling to verify removal of contaminated soils and obtain regulatory closure of these sites

The objectives at the former UST sites and MSC JP5 pipeline units are to collect soil and groundwater data, evaluate the potential risk to groundwater quality that is caused by the vadose zone release by performing vadose zone and/or groundwater sampling, if required excavation of near surface and subsurface contaminated soils identified by previous investigations and obtain regulatory closure of these sites. This SHSP is intended for use as a reference by field personnel during field sampling activities.

1.4 Scope of Work

The SHSP will apply to work performed by RMA at the Facility. The scope of work for this project includes closure of inactive temporary accumulation areas and other sites. Activities covered by this SHSP include the following:

- Mobilization/Demobilization
- Utility Clearance/Site Survey
- Drilling
- Sampling by Direct Push Techniques
- Hand Auguring /Excavation
- Sampling of Groundwater /Purging Wells

These tasks are detailed in the Task Hazard Analysis included in Attachment 1.

2.0 KEY PERSONNEL AND MANAGEMENT

RMA maintains a policy of providing its employees, subcontractors, and authorized visitors with information and procedures in order to protect them and the adjacent community from any adverse effects that might result from work at a job site involving potentially hazardous substances. All personnel involved with this project will follow the H&S procedures set forth in this SHSP. Visitors will not be given entry unless they read and agree to comply with this plan. The SHSP Acknowledgment Form will be signed by everybody who actively participates during this project. Key project personnel are identified in Table 2.1, "Emergency Phone Numbers," of this SHSP.

2.1 Project Manager

The Project Manager, Mr. Steve Mohammad, communicates directly with the Navy and will serve as the primary point of contact. The Project Manager's responsibilities include project scheduling, cost updating, overall project direction, and overseeing site safety. In addition, the Project Manager is responsible for determining the extent and level of input required for technical issues that arise during the duration of the project. The Project Manager's direct subordinate will be the Project Superintendent for site activities.

2.2 Project Health and Safety Manager

The Project HSM for this project is Dr. Maureen Sassoon. Dr. Maureen Sassoon is a Certified Industrial Hygienist with more than 10 years of experience in the chemical and environmental remediation industries. Dr. Maureen Sassoon will be responsible for the review of the SHSP. She has the authority to stop unsafe operations, remove unqualified personnel from the work area, and approve changes to the SHSP.

The HSM is responsible for integrating all aspects of the SHSP from development to implementation. Her duties include assigning an HSO to implement the SHSP, advising the HSO on all related H&S aspects, reviewing any site-specific plans for compliance and completeness, and establishing and monitoring all related H&S procedures through site safety audits.

2.3 Site Health and Safety Officer

The HSO for this project is Sean Moncrief. The HSO will implement and enforce the project safety program and procedures at the project site. The HSO will conduct the daily safety meetings and will interface as required with other site representatives. The HSO performs duties

such as confirming personnel are fit for duty, coordinating emergency medical care, conducting a daily site safety inspection, reviewing AHAs with all new workers, reviewing AHAs when new activities are conducted and inspecting health and safety equipment. The HSO shall have OSHA construction health and safety training, CPR/first aid training and competent person training. The HSO will be on-site at all times during work activities.

In addition, the HSO is responsible for maintaining safety equipment, providing site safety orientation and training for all personnel actively involved in site work, and maintains other site safety documentation. The HSO takes the following action(s) when appropriate:

- orders the immediate shut down of site activities in the case of a medical emergency or unsafe practice
- ensures protective clothing and equipment are properly stored, used, and maintained
- ensures that the environmental and personnel monitoring operations are ongoing and in accordance with technical specifications and required procedures
- restricts visitors from areas of potential exposure to harmful substances

The HSO is responsible for on-site implementation and enforcement of the site safety program and procedures. He will oversee any personnel monitoring and will decide when action levels have been reached which require more stringent personnel protection. The HSO establishes and enforces the protective equipment to be used for various site activities. The HSO ensures that the protective equipment used for various site activities meets the requirements of this SHSP. When conditions change, the HSO coordinates with the HSM to modify the protection to ensure employee protection is appropriate for the new conditions.

The following logs, reports, and records will be developed and maintained on site by the HSO.

- daily safety meetings
- activity HA forms
- training logs (site-specific and visitors)
- safety inspection logs
- employee/visitor sign-in
- ambient and personal air monitoring results
- Site Health and Safety Plan
- SHSP Change Approval Forms

2.4 *Project Superintendent*

The Project Superintendent for this project is TBD. The Project Superintendent is responsible for all field activities and enforces safe work practices by all field members. The Project Superintendent watches for any effects on field members, especially those symptoms possibly caused by heat stress or chemical exposure. The Project Superintendent oversees the safety of any visitors who enter the site. The Project Superintendent maintains communication with the RMA Project Manager and the Navy on-site representative. The Project Superintendent and or their designated alternate will be on-site at all times during work activities.

2.5 *Employee Safety Responsibility*

Although the employer is responsible for providing a safe and healthful work place, every employee is responsible for their own safety as well as the safety of those around them. Employees will use all equipment provided in a safe and responsible manner as directed by the Project Superintendent. All RMA personnel will follow the policies set forth in this SHSP and in the RMA Health and Safety Policies and Procedures Manual.

Every employee is responsible for reporting any injuries, incidents, and safety infractions to the Project Superintendent or the HSO so treatment can be obtained and/or corrective action taken.

3.0 HAZARD/RISK ASSESSMENT

This section discusses chemical, physical, and environmental hazards to workers on the sites. Section 3.1, Chemical Hazards, discusses the contaminants of concern and includes information on exposure limits and signs and symptoms of exposure. Section 3.2, Physical Hazards, discusses physical hazards identified at the sites including those associated with construction, use of heavy equipment, fire hazards, and electrical hazards. Section 3.3, Environmental Hazards, discusses environmental hazards including those associated with the physical location of the sites and weather conditions. Section 3.4, Accident Prevention, describes the RMA Accident Prevention Plan.

Daily tailgate safety meetings are held at the start of each shift. Prior to the day's remediation activity the potential chemical, physical, environmental hazards and preventative safety measures are discussed. Attendance is mandatory and will be recorded.

An AHA has been developed for each planned activity and operation occurring in each major phase of work. The AHA identifies the sequence of work, specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard. The appropriate AHA forms will be used to augment daily safety meetings in an effort to heighten safety and hazard awareness on the job. AHAs will also be reviewed with all new workers and when new activities are being performed.

3.1 Chemical Hazards

Table 3-1, Chemical Hazards Assessment, list the primary chemicals of concern, their PELs/TLVs and signs/symptoms of over-exposure that may be encountered at the site. Table 3-2, Known Concentrations in Soil and Water, list the chemicals of concern and their maximum recorded concentrations in the concerned areas. Material Safety Data Sheets (MSDS) are provided for chemicals that may be encountered on sites or brought to the sites. The MSDSs will be reviewed with all personnel during the daily safety meetings. Generic MSDSs for the chemicals that may be encountered will be kept in a three ring binder on site and updated as necessary. Personnel will be informed of the location of the binder before the commencement of any field work Levels of protection and air monitoring requirements will be based initially on the data provided or obtained prior to remediation work. These requirements may change as site conditions are more fully evaluated when work is underway. Changes to the SHSP regarding additional chemical hazards require review and approval by the HSM, prior to any work with the chemicals.

RMA protective equipment requirements, combined with the requirement to wash one's arms, face, and hands before using the toilet, eating or smoking should prevent exposure during these activities. In addition, the project HSO and Project Superintendent will observe and warn the field members to be aware of the initial symptoms of chemical exposure. The amount of exposure depends primarily on the specific activities undertaken and the care with which the activities are performed. Any field member will be removed from the work site and medically evaluated if the following initial symptoms persist and are unexplained by other causes (such as allergy, common cold, heat stress etc.):

- dizziness or stupor
- nausea, headaches, or cramps
- irritation of the eyes, nose, or throat
- euphoria
- chest pains and coughing
- rashes or burns

Hazard Communication Program-The purpose of a Hazard Communication or Employee Right-to-Know Program is to ensure that the hazards of all chemicals located at this field project site are communicated according to 29 CFR 1926.59 to all RMA personnel and RMA subcontractors. A written hazard communication program has been established for RMA, which includes the following:

- **Container Labeling**-RMA personnel will ensure that all drums and containers are labeled according to contents. Drums and containers include those produced from manufacturers and by on-site operations. All incoming and outgoing labels will be checked for identity, hazard warning, and name and address of responsible party.
- **MSDSs**-There will be an MSDS located on site for each hazardous chemical used or known to be on site.
- **Employee Information and Training** — Training employees on chemical hazards is accomplished through formal safety training conducted annually and through daily informal safety meetings. Project-specific chemical hazards are communicated to employees through an initial site orientation meeting and during daily safety meetings held at the RMA field projects.

At a minimum, RMA employees will be instructed on the following:

- chemicals and their hazards in the work area
- how to prevent exposure to hazardous chemicals
- what the company has done to prevent workers' exposure to chemicals

- procedures to follow if they are exposed to chemicals
- how to read and interpret labels and MSDSs for hazardous substances found on RMA sites
- emergency spill procedures
- proper storage and labeling

When any new hazardous material is introduced or discovered on site, employees will be given information about the material at the daily safety meeting. The Project Superintendent will be responsible for seeing that the MSDS on the new chemical or material is available on site.

3.2 Physical Hazards

There are numerous physical hazards associated with this project which, if not identified and addressed, could cause accidents and personal injury to the work force as well as operational problems. In order to minimize physical hazards, RMA has developed standard safety protocols, which will be followed at all times. Failure to follow safety protocols or continued negligence of these policies will result in discipline of the employee.

All RMA personnel are familiar with the field activities, which will be conducted at the site. They are trained to work safely under various field conditions. In addition, the Project Superintendent will observe the general work practices of each field member and equipment operator, and enforce safe procedures to minimize physical hazards. Also, hard hats, safety glasses, safety vests, and safety boots will be required in all areas of the sites.

3.2.1 Tripping, Slipping, and Falling Hazards

RMA personnel and subcontractors will be reminded daily to maintain sure footing on all surfaces. Safety belts or harnesses will be required by any personnel working 6 feet above any surface, including man lifts. Use of handrails when climbing stairs will be enforced. Personnel will not work under any suspended loads or under any equipment such as loader buckets and excavators.

In order to minimize tripping hazards caused by debris, job supplies, and equipment, material will be removed daily from the work areas and stockpiled in their respective storage areas. This "housekeeping" effort will be enforced by the HSO throughout the day.

3.2.2 Falling Objects

This project can be accomplished without any object, regardless of size, free falling to the ground. All items raised will be slowly lowered to the ground using a grapple or skip bucket, or

other similar pieces of equipment. No personnel will work under this equipment at any time. Also, the HSO will ensure that the area is clear of personnel while the equipment is in operation.

3.2.3 Heavy Equipment and Traffic

Drilling activities will involve working around drilling equipment. The use of such equipment presents the greatest potential for injury to personnel. The moving parts of heavy equipment create pinch points, which can cause serious injury. In all cases, rotating shafts or gears should be covered to prevent accidental contact. In the case of Drill Rigs, rotating parts (the auger), will be guarded to prevent employee contact. All mobile equipment operators will have had the required training and demonstrate the necessary skills to operate the heavy equipment.

The primary hazard around heavy equipment is the lack of visual contact with equipment operators. Personnel needing to approach heavy equipment while operating will observe the following protocols:

1. Make eye contact with the operator (and spotter).
2. Signal the operator to cease activity.
3. Approach the equipment and inform the operator of intentions.

All personnel working around drilling equipment will wear hard hats, steel-toed boots and a brightly colored vest or shirt. Mobile equipment should be equipped with occupant restraints and/or rollover protection according to 29 CFR 1926, Subpart O. All heavy equipment and trucks (except for pick-up trucks) will have back-up alarms.

3.2.3.1 Operator Qualifications

Only qualified operators, familiar with the equipment to be used, will be permitted to operate the drilling equipment. Subcontractors will supply proof of their operator's capability and experience to operate the equipment in a safe manner. Operator qualifications will be submitted separately. RMA reserves the right to remove from the project site any operator if there is question or doubt concerning that operator's capabilities.

3.2.4 Electrical Hazards

In order to prevent accidents caused by electrical shock, the Project HSO will inspect electrical connections. They will shutdown and lockout any equipment which is found to have frayed or loose connections until a qualified electrician can be contacted. The equipment will be de-energized and tested before any electrical work is done. All equipment will be properly

grounded prior to and during all work. In addition, ground fault circuit interrupters (GFCI) will be installed for each outdoor circuit between the power source and tool. In the event that generators are used to supply power, these generators will contain GFCIs.

3.2.5 Confined Space Entry

A confined space is any area large enough to bodily enter, but has a limited entrance/exit and is not built for continual occupancy. Examples of confined spaces include, but are not limited to, the following: tanks, boilers, vessels, bins, manholes, tunnels, pipelines, underground utilities vaults, or any open top space more than 4 feet in depth such as pits, tubes, trenches, or vessels.

No confined space entry is planned for this project. If a confined space entry is required, the HSO will contact the HSM and prepare a Safety Plan Change Form as described previously.

3.2.6 Underground Utilities

Contact with buried electrical utilities presents a great potential for worker harm. Buried utilities may be present during drilling activities. Prior to the start of intrusive operations all pertinent station drawings will be obtained and reviewed and authorization from all concerned public and base utility department offices will be obtained. USA Dig Alert will be notified to locate and mark all utility lines for which they are responsible. RMA is responsible for locating and marking any government owned utility lines near the excavation. Should intrusive operations cause equipment to come in contact with utility lines, the SSO and HSO will be notified immediately. Work will suspend until the appropriate actions for the particular situations can be taken.

3.2.7 Overhead Electrical Hazards

Overhead power lines may present a hazard to equipment and personnel. To prevent equipment contact with power lines and to prevent arcing, adequate clearance must be maintained. Guidelines found in the USACE Health and Safety, EM 385-1-1 November 2003 will be used to determine the minimum clearance.

For lines rated 50 kilovolts (kV) or below, the minimum clearance between the lines and any part of the crane or load will be 10 feet. For lines rated between 51 kV and 200 kV, the minimum clearance between the lines and any part of the crane or load will be 15 feet. For lines rated between 201 kV and 300 kV, the minimum clearance between the lines and any part of the crane or load will be 20 feet. For lines rated between 301 kV and 500 kV, the minimum clearance between the lines and any part of the crane or load will be 30 feet.

3.3 *Environmental Hazards*

Environmental hazards associated with this site will be discussed at the orientation meeting prior to startup of remediation activities. Personnel will be apprised of symptoms of exposure to certain biological hazards and heat stress.

3.3.1 Heat Stress

The potential for heat stress is a concern when field activities are performed on warm, sunny days and is accentuated when chemical protective clothing is worn. Heat stress prevention measures and monitoring will be implemented if ambient temperatures are above 80 degrees Fahrenheit (°F).

Precautions to prevent heat stress will include work/rest cycles so that rest periods are taken before excessive fatigue occurs and regular intake of water to replace that lost from sweating. Work/rest cycles will be based on monitoring the heart rate (pulse) of each individual worker. Rest breaks will be long enough to reduce the heart rate (HR) below levels calculated according to the following method:

(i) Workers will initially determine their resting HR prior to starting work activities.

(ii) At the start of the rest period, workers will determine their initial HR. This initial HR should not exceed the individual's age-adjusted maximum HR, which equals [(0.7) (220 age in years)]. At 1 minute into the rest period, the recovery HR will be determined. The recovery HR should not exceed 110 beats per minute.

(iii) If the initial HR exceeds the age-adjusted maximum HR or the 1-minute recovery HR is greater than 110 beats per minute, then the next work period will be decreased by 10 minutes.

An initial work/rest cycle of 1-hour work and 15 minutes rest is recommended for protection of staff when the heat stress hazard is high. The recommended cycle will be adjusted up or down based upon worker monitoring, environmental conditions, and the judgment of the HSO. At any time, field team members recognize the signs or symptoms of heat stress prior to a scheduled rest period, they will notify the HSO immediately in order that a rest period can be called.

Heat stress due to water loss can be prevented. To prevent dehydration, water intake must approximate sweat loss. Water intake guidelines are as follows:

(i) The sense of thirst is not an adequate indicator of water replacement needs during heat exposure. Therefore, water must be replaced at prescribed intervals, as follows:

(a) Before work begins, drink two 8-ounce glasses of water;

(b) During each rest period, drink at least two 8-ounce glasses of water.

(ii) Plain water, served cool, is excellent. An adequate supply of drinking water (at least one gallon per person per day) and clean cups will be readily available (i.e., at the support vehicle) to provide water during rest periods.

(ii) Adding salt to water is not recommended. However, other fluids, in addition to water, could include fruit juices and diluted electrolyte replacement drinks (diluted 3:1 with water). **Do not use salt tablets!**

Heat stress, if not prevented, results in heat stress illnesses. Two critical illnesses, if not recognized and treated immediately, can become life threatening: heat exhaustion and heat stroke. Heat exhaustion will result if the prevention measures described above are not implemented. If ignoring the signs and symptoms of heat exhaustion and measures described above are not implemented, heat exhaustion will lead to the development of heat stroke. Heat stroke is an immediate, life-threatening condition that results because the body's heat regulating mechanisms shut down, and the body cannot cool itself sufficiently. As heat is excessively stored in the body, brain damage can result causing permanent disability or death.

The signs and symptoms of **heat exhaustion** are headache; dizziness; nausea; weakness; fainting; profuse sweating; loss of appetite; approximately normal body temperature; dilated pupils; weak and rapid pulse; shallow and rapid breathing; possible cramps in abdomen and extremities; possible vomiting; difficulty walking; and **skin that is cool and sweaty to the touch with pale to ashen-gray coloring.**

First aid for heat exhaustion is as follows:

- Immediately remove victim to the support area; if you are the victim, go to the support area.
- Decontaminate, if practical, before entering support area.
- Start cooling, but be careful not to cause a chill (i.e., rest in shade and apply wet towel to forehead; open up and/or remove clothing as much as practical, especially chemical-resistant clothing).
- Drink cool water slowly, but only if conscious and not in shock.
- If vomiting, and/or the signs and symptoms are not lessening within an hour, call for emergency help and/or transport the victim to emergency room.

It is likely that a heat exhaustion victim will be unable to work for the remainder of the day.

The signs and symptoms of **heat stroke** are **hot, dry skin to the touch with reddish coloring;** body temperature >105 degrees °F; no sweating; mental confusion; deep, rapid breathing that sounds like snoring progressing to shallow, weak breathing; headache; dizziness; nausea; vomiting; weakness; dry mouth; convulsions; muscular twitching; sudden collapse; possible unconsciousness.

First aid for heat stroke is as follows:

- Immediately remove the victim to the support area; prior to entering the support area, remove and dispose the victim's chemical-resistant clothing.
- Cool the victim rapidly using whatever means are available, such as shade, opening up and/or removing clothing, soaking clothing/skin with water and fanning, placing victim in vehicle using air conditioning on maximum.
- Do not give drinking water to an unconscious victim.
- Treat for shock, if needed.
- Transport the victim to the emergency room or call for emergency help-no exceptions for heat stroke victim.

3.3.2 Noise

Noise is a potential hazard in areas where equipment power tools, pumps or generators are operated. Equipment operation may produce noise levels that reach or exceed 85 decibels (DBA), the action level established by the OSHA. Exposure to elevated noise levels can lead to temporary or permanent hearing loss and can also cause muscle tension and irritability. The HSO will ensure hearing protection is utilized when noise levels are elevated. Elevated noise levels will be evaluated by the HSO when equipment is operated. Excess noise levels can be estimated using the following rule of thumb. When normal voice communication is not possible between field personnel who are no more than three feet apart, hearing protection will be utilized. Hearing protection typically involves the use of disposable earplugs for the duration of the excessive noise level and will be used during operations that present a noise hazard. Hearing protection will be optional for employees exposed to sound pressure levels of 85 dBA or less.

3.3.3 Biological Hazards

There are a variety of biological hazards to which personnel may be exposed while performing work. These hazards may include animal bites, insect stings, contact with poisonous plants, and exposure to pathogenic (disease producing microorganisms). Serious and/or threatening physical hazards frequently overshadow any potential exposure to biological hazards. However, specific

biological hazards can cause injury and even death. Therefore, when appropriate, such hazards will be identified and evaluated. The Site HSO will screen the area for biological hazards prior to beginning work.

Black widow spiders present the greatest insect hazard, since they prefer dark locations and often dwell in monitoring well boxes. Personnel will be instructed to check for black widows before putting their hands in a monitoring well box. First aid will be administered to anyone suspected of being bitten.

Other insects that may present potential hazards include bees, wasps and yellow jackets. If a victim has been stung by an insect and is known to be allergic or shows signs of an allergic reaction, that victim will receive immediate medical attention.

Vermin such as feral cats, skunks, rats, mice, squirrels and rabbits, which could be encountered during the project may be carriers of disease. The Site HSO shall be notified when vermin are identified in work areas. Bites will be immediately reported and medical care obtained.

Rodent-borne diseases, including Hantavirus, resulting in sever respiratory distress, are present in the southwestern United States. Infections may occur in humans, who are in contact with rodents, rodent saliva, or rodent excreta. Transmission of disease may occur through contact with conjunctivae or broken skin, ingestion of contaminated food or water, or inhalation. Workers will be advised that if a fever or respiratory illness develops within 45 days of the potential exposure, they should seek medical attention and inform the physician of potential Hantavirus exposure.

Valley Fever is a disease of the lungs which is also present in the southwestern United States. It is caused by a fungus, which grows in soils in areas of low rainfall, high summer temperatures, and moderate winter temperatures. These fungal spores become airborne when the soil is disturbed by construction or other activities. Workers will be advised that if a fever, rash or chronic cough develops within 21 days of the potential exposure, they should seek medical attention.

Personnel will receive training on site-specific biological hazardous, as well as on personal hygiene practices prior to field activities. Personal hygiene practices, such as frequent hand washing, help prevent rodent-borne diseases.

3.4 Accident Prevention

This SHSP has been developed with accident prevention as the primary goal. Details are discussed throughout this SHSP. This section will outline the Accident Prevention Plan put in place for this project.

3.4.1 Administrative Responsibilities

The Project Manager is ultimately responsible for the safety and health of site personnel. The Project Manager is to provide the materials and equipment necessary to enhance and maintain safe site and work conditions.

The Project Superintendent has the responsibility and the authority to control the day-to-day remediation activities in the field. The Project Superintendent reports to the Project Manager. The Project Superintendent will watch employees for signs of heat stress, excessive fatigue, and obvious outward signs of chemical exposure. In addition, the Project Superintendent will ensure that equipment brought to the site is in proper working condition, inspected regularly, and operated in a safe manner.

The HSO reports to the Project HSM and is responsible for pointing out unsafe conditions that may pose a hazard to personnel or the public. The HSO is required to conduct regular safety inspections. Accident investigations will be performed by the HSO, the Project Superintendent, or both.

3.4.2 Site-Specific Training

All field employees are currently 40-hr OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) certified having taken an annual 8-hr refresher course if applicable. Prior to working on site, all site personnel will undergo a safety and health orientation where the SHSP and site conditions will be discussed. Prior to each shift, a daily safety meeting will be held discussing the previous day's and the current day's H&S issues. Records of these meetings will be kept. A safety meeting is also held at the end of each shift per Navy requirements.

3.4.3 Subcontractors

Subcontractors are subject to training in functions in which they will be participating. Subcontractors will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. Subcontractors will be expected to abide by their RMA's Health and Safety Plan as well as their own companies safety policies. The subcontractors report to the RMA Project Superintendent.

3.4.4 Layout of Job Site

Activities will occur at a number of locations within the base. During the pre-work meeting the ROICC will specify where all IDW and equipment will be temporarily stored. Subcontractors are subject to the same controls as RMA personnel. See Section 4, Work and Support Areas, of this SHSP.

3.4.5 Temporary Site Amenities

Portable toilets complying with Cal-OSHA requirements will be available if needed. Potable water for hand washing will be available.

3.4.6 Housekeeping

The project site will be kept in a neat and orderly fashion to prevent common injuries due to slips, trips and falls, and to maintain a professional work site. Personnel will not leave a work area in a disorderly condition. Accumulated trash will be removed at least weekly to minimize hazards caused by insects, bacteria, and decomposition. The Project Superintendent is responsible for maintaining a clean job site with safe access and egress.

3.4.7 Emergency and Contingency Plan

Fire extinguishers (ABC type) with a current inspection record will be placed in temporary work areas and in RMA field vehicles on the job site. RMA has developed an emergency contingency plan provided in Section 7, Emergency Response, and Section 8, Spill and Discharge Control Plan, of this SHSP.

3.4.8 Safety Inspections

The HSO, Project Superintendent or his designee will perform regular safety inspections. A report including results of the inspection and any corrective actions taken will be filed in the project files, with a copy to the Project HSM. Identified safety and occupational health deficiencies and corrective measures will be recorded in the Contractor Quality Control Report.

3.4.9 Accident Investigation

An injury that requires only minor first aid need only be recorded on a first aid treatment log, which will be maintained on file and available for review. All other injuries or occupational illnesses must be investigated and the Accident/Injury Report Form located in the RMA Health and Safety Procedures Manual must be completed (RMA, 1996).

In the case of an injury to an employee that requires medical treatment, the following steps will be followed:

1. Procure medical treatment for employee as described in Section 7 of this SHSP. Notify HSM.
2. The HSO and Project Superintendent will investigate the incident and fill out an Accident/Injury Report Form. This form is faxed to the Project Manager within 24 hours of incident occurrence.

3. The Project Manager will complete the Employer's Report of Injury and send it to the Worker's Compensation Insurance Company within 48 hours of an injury or within 24 hours of a lost time injury or death. A claim for worker's compensation benefits will also be submitted.
4. Notify the Navy within 24 hours of the injury.
5. A report must be obtained from the physician clearing the employee to resume regular duties, describing acceptable modified work, or removing the employee from work duty.

In the case of a fatal injury or where three or more persons are admitted to the hospital for an overnight stay, Fed-OSHA and other appropriate agencies will be notified within eight hours and an in-depth accident investigation will be conducted.

3.4.10 Accident Reporting

Injuries that require only minor first aid need only need be recorded on a first aid treatment log, which will be maintained in a file and available for review. All other injuries or occupational illnesses must be investigated and an Accident/Injury Report Form located in Attachment 2. RMA will also maintain records of all exposure and accident experiences. Current OSHA 300 Forms will be provided upon request.

4.0 SITE CONTROL AND WORK ZONES

Work zones shall include the immediate vicinity of the site, within an approximately 20-foot radius of well locations. A decon area will be set up adjacent to work zones that will be used to conduct all decontamination activities. Access to the work zones during field activities will be limited to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors, and the public. During drilling activities, the equipment will be oriented to minimize its impact to surrounding vehicles, buildings and other site-specific obstacles. Non-RMA personnel will be directed away from the immediate area of the sampling equipment.

Access to all work zones will be regulated, while field activities are being performed. No visitors, regardless of affiliations or approvals, will be permitted within any work zone unless they provide documentation of the training and medical surveillance requirements specified in this plan, and have read and signed this SHSP. Under no circumstances shall anyone enter the area without authorization from the SSO. This shall include client, utility, and regulatory representatives.

5.0 PERSONAL PROTECTIVE EQUIPMENT

The harmful effects that chemical substances have on the human body often necessitate the use of respiratory protection and personal protective clothing. Proper selection of personal protective equipment (PPE) depends upon a number of factors. Protection against different types of chemicals and differing concentrations of those substances can be quite varied. The tasks to be performed and the probability of exposure to the substances must also be considered when specifying protective clothing.

Once the specific hazard has been identified, appropriate PPE can be selected. The protection level assigned must match the hazard confronted. The specific equipment comprising each level of protection will vary slightly, but are defined primarily by the type of respiratory protective equipment used, and secondly by skin protection. The ensuing list briefly describes the EPA Level categories:

Level A: Used when the greatest level of skin, eye, and respiratory protection is needed and consists of a totally encapsulated suit with supplied breathing air.

Level B: Used when the highest level of respiratory protection is needed but a lesser level (than Level A encapsulating suit) of skin protection is required.

Level C: Used when criteria for using air-purifying respirators are met and a lesser level of skin protection is required.

Level D: Used only as a work uniform and in area without respiratory hazard.

5.1 Anticipated Levels of Protection

Based on information available from SWDIV, RMA's site walk, and the previous site investigations, the work activities can be performed using Level D PPE. Therefore, RMA personnel and subcontractors will wear Level D PPE for field activities, unless working conditions warrant an upgrade to Level C.

5.1.1 Level D

Level D protection is the lowest level of personal protection allowed on hazardous waste sites. Respiratory protection is not required, as the atmosphere is assumed to be breathable and uncontaminated.

Level D protection will consist of the "basic work clothing" plus:

- Hardhat*;
- Coveralls/Standard Work Clothing;
- Safety glasses*;
- Safety-toed work boots*;
- Chemical-resistant (e.g., butyl or nitrile) inner gloves
- Immediately available half-face, air purifying respirator with NIOSH approved combination organic vapor/acid gases/high efficiency dust filter (HEPA) cartridges (yellow/magenta).
- Earplugs will be worn if, at any time, verbal communication becomes difficult to comprehend within a radius of three feet.

* Hard hats, safety glasses (goggles), and safety shoes must meet American National Standards Institute (ANSI) approval.

5.1.2 Level C

Level C protection is defined by the use of a full-face or half-face, air-purifying respirator. This level is used when low levels of known contaminants are present, sufficient oxygen is available, and contaminants are not considered immediately dangerous to life and health (IDLH).

Level C will consist of Level D above, plus:

- Half-face, air-purifying respirator with NIOSH approved combination organic vapor/acid gases/high efficiency dust filter (HEPA) cartridges (yellow/magenta).
- Chemical-resistant disposable outer coveralls (e.g., Tyvek™ or polyethylene-coated Tyvek™)
- Chemical-resistant (e.g., nitrile) outer gloves (taped to outer coveralls)
- Chemical-resistant (e.g., nitrile) inner gloves
- Chemical-resistant safety boots (taped to coveralls)

5.2 Reassessment of Personal Protection Equipment

The level of protection listed in this section will be upgraded or downgraded based on action levels from direct reading instruments, a change in site conditions, or findings from investigation. Changes in protection levels requires the approval of the following site personnel:

- HSO
- Project Manager or Project Superintendent

If the level of protection is to be downgraded, then personnel will continue to work in the original level of protection until the HSO and the Project Manager or Project Superintendent have discussed air monitoring results and rationale for downgrade. After an agreement has been reached and the change is recorded on the SHSP Change Approval Form, PPE may be modified with approval from the HSM. Level of protection for any task may be upgraded at any time and documented. Table 5.2, Personal Protection Equipment, defines the required PPE for each work activity while Table 5.3, Action Levels, describes the action levels for PPE upgrade.

6.0 DECONTAMINATION

Decontamination involves the physical removal and/or neutralization of harmful contaminants. The extent of decontamination depends on the hazard and the quantities of the contaminant. The decontamination at this site will be minimal since no contamination is anticipated to be present in either the soil or groundwater. However, decontamination procedures presented below will be strictly adhered to, to prevent any potential exposure at these sites.

Contamination can occur from:

- Contacting vapors, gases, mists, or air particulates.
- Contacting liquids while sampling or opening containers.
- Walking or driving through puddles or on contaminated soil.
- Handling contaminated instruments or equipment.
- Assisting contaminated personnel during operations, decontamination procedures, and emergencies.
- Chemicals used for the decontamination of equipment.
- Vinyl or butyl gloves.

The SSO will determine the level of protective gear appropriate for personnel and equipment decontamination.

6.1 Decontamination Procedures

Contamination reduction procedures appropriate for the existing work area will be developed and specified by the SSO. Such procedures must be in place before site operations begin, and they must remain in place (modified as necessary) throughout the period of activity. Whenever possible, the need for decontamination should be reduced through work practices that minimize contact with contaminants. Personnel should avoid walking through heavily contaminated areas, should not kneel or directly touch contaminated materials and should use remote handling and sampling techniques when feasible. Decontamination will be performed only in designated areas. Separate areas may be set up for equipment and personnel.

6.2 *Decontamination Hazards*

Contamination on the upper areas of protective clothing poses a greater risk to the worker because volatile compounds could make breathing hazardous both for the worker and for the decontamination personnel. There is also an increased probability of contaminant contact with the skin when the worker is doffing the upper part of the clothing.

Disposable items (Tyvek™ coveralls, inner gloves, and safety boots) must be replaced as they become heavily soiled, torn at any portion, or when personnel break for extended periods of time. Dual respirator canisters will be changed as deemed appropriate by site air monitoring data and personnel determination of contaminant breakthrough.

The assigned level of protection for a site also impacts the complexity of the decontamination effort. The higher the level of protection, the more equipment must be managed with every site entry or exit.

6.3 *Personnel Decontamination*

Decontamination procedures are carried out on all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuations) will personnel be allowed to leave the site without decontamination.

Decontamination of personnel should be performed in the decon area, a controlled area adjacent to the work zone, and should consist primarily of a soap and water wash and water rinse of exterior protective gear to remove contaminants, followed by doffing of the gear. Coveralls should be removed by turning the clothing inside out. A procedure appropriate to the degree of contamination should be established. The extent of washing required, or modifications to the sequence, may be specified as appropriate.

6.3.1 Level D Personnel Decontamination

Personnel exiting the work area while site activities require the use of Level D PPE (as outlined in Section 5.1.1) will perform decontamination in accordance with the following guidelines:

- Place tools, instruments, samples and trash in a designated location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be

completely cleaned off of equipment, samples, and tools prior to removal from the work area.

- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Prior to exiting the work areas, personnel will wash their hands with soap and water in order to minimize the potential for contaminant exposure.

6.3.2 Level C Personnel Decontamination

Personnel involved in site activities that require the use of Level C PPE (Section 5.1.2) will perform the decontamination procedures outlined below.

- Hardhats tools, instruments, samples and trash will be placed in their appropriate locations. These areas should be clean and dry, and at a minimum contain plastic bags for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspect equipment, samples and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples and tools prior to removal from the work areas.
- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Wash and rinse outer work gloves and boots (boot covers) with soap and water.
- Wash/brush off outer protective coverall (Tyvek).
- Untape wrists and ankles.
- Remove outer work gloves and place them in a container specified for waste PPE.
- Remove outer Tyvek coveralls and place them in an appropriate container specified for waste PPE.
- Remove respirator mask (also goggles if worn).
- Wash hands using soap and cleaners/solutions.

6.4 *Equipment Decontamination*

Equipment to be decontaminated includes heavy equipment, tools, and the decontamination equipment itself when the decontamination process is finished. Before entering the site, all equipment will be cleaned to remove grease, oil, encrusted dirt, and other potential contaminants. Wherever possible, gross contamination of equipment will be removed in the work area prior to bringing equipment back to the decontamination area. General equipment decontamination will consist of a soap and water wash followed by a final water rinse. If soap and water alone cannot remove the contamination, additional procedures may be used such as a solvent rinse/wipe or steam cleaning.

6.4.1 Tools

Tools will be dropped into a plastic pail, tub or other container where they will be brushed off, rinsed, and brought to the decontamination station. Generally, tools will be washed with a detergent solution and then rinsed with clean water. Wooden tools are not to be used, as they cannot be adequately decontaminated due to their absorptive properties.

6.4.2 Sampling Equipment

Sampling equipment will be decontaminated before and between sampling to prevent cross contamination, and when the equipment leaves the work area. Sampling equipment may include trowels, shovels, bailers, sleeves, and backhoe buckets. All sampling equipment will be decontaminated using Alconox or an equivalent detergent, followed by two clean water rinses. The sampling tool will then be rinsed with deionized or distilled water and air-dried.

6.4.3 Heavy Equipment

Backhoes, loaders and other heavy equipment shall be cleaned with high-pressure water or a portable high-pressure steam spray followed by a soap and water wash and rinse. Loose material shall be removed by brush. All cleaning water should be collected and stored in approved 55-gallon drums or suitable containers and sampled to determine proper disposal options.

6.4.4 Respirator Decontamination

Respirators when worn will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside or disposed of and the rest placed in a cleansing solution. Personnel will inspect their own masks to be sure of proper strap readjustment for correct fit. Certain parts of contaminated respirators, such as the harness assembly are difficult to

decontaminate. If contaminated, they will be discarded and replaced. In addition to being decontaminated, all respirators, protective clothing, and other personal articles must be sanitized before they can be used again. The insides of masks and clothing become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator mask. If practical, protective clothing should be machine washed after a thorough decontamination. Otherwise it should be cleaned by hand.

6.5 Disposal of Decontamination Waste

Solid and liquid decontamination waste should be containerized. Solids may be double bagged, or placed in a sealed drum or similar container. Liquids will be collected during decontamination and placed in 55-gallon drums or pumped into holding tanks for future testing and disposal. The drums will be clearly labeled for content, the operation from which they were filled, and the dates. The decontamination water shall not be stored on-site greater than 90 days.

6.6 Decontamination During Emergencies

Often during emergencies the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. It may be that the time lost or the additional handling of an injured person during the decontamination process may cause greater harm to the individual than the exposure that would be received by undressing that person without proper decontamination. This decision must be made by the HSO. The HSO, as the on-site focus for safety matters, must be familiar with the safety criteria and the logic behind them. Each operation is different, and the risks to personnel from exposure vs. injury are different.

An additional consideration to include when bypassing decontamination of injured personnel is the acceptance of contaminated personnel at emergency medical facilities. Many facilities will not accept contaminated personnel. Site response personnel should accompany contaminated victims to the medical facility to advise medical personnel on matters involving decontamination. A copy of this HASP will accompany the injured worker to the medical facility.

6.6.1 Physical Injury

Physical injuries can range from minor to life threatening. Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if this does not cause delays, interfere with treatment, or aggravate the problem. Respiratory masks and backpack assemblies must always be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away.

If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating medical personnel and/or the inside of ambulances. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim unless it is known that he has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

6.6.2 Heat Stress

Heat-related illness ranges from heat fatigue to heat stroke, the latter being the most serious. Heat stroke requires prompt treatment to prevent irreversible damage to health or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately.

7.0 EMERGENCY RESPONSE

Prior to field activities, the Project Superintendent will plan emergency egress routes and discuss them with all personnel who will be conducting fieldwork. Initial planning includes establishing emergency warning signals and evacuation routes in case of an emergency. An Evacuation Route Map is presented as Figure 7-1. This map shows the Emergency Meeting Location and egress routes. Site evacuation will be accomplished by quickly leaving the site, proceeding to the Emergency Meeting Location and awaiting further instructions. A map illustrating the route from the Emergency Meeting Location at the Main Gate to the nearest emergency medical facility is presented as Figure 7-2.

7.1 Emergency Services

Upon arrival at the site, the Project Superintendent will ensure that all personnel know the system for communication of emergency situations. This section provides concise and clear directions and contact information for local emergency services (See Section 7.8). Use a phone or use a cellular phone (if phone lines are not installed) to summon emergency assistance. All personnel on this project will know how to use a portable fire extinguisher.

The following emergency equipment will be present at each site and field vehicle:

- fire extinguisher (20-pound ABC dry chemical; 2-pound or 5-pound dry chemical on each piece of heavy equipment)
- first aid kit
- a spill station will include all necessary and applicable spill containment materials, appropriate PPE for each task
- Route to Hospital Map (Fig 7-2)

7.2 *Site Communications*

Successful communication between field teams and contact between personnel in the various zones is essential. The following communications systems will be available during site activities:

- intrinsically safe two-way radios
- hand signals (as agreed upon prior to start of work activities; additional signals will be specified in ANSI/American Society of Mechanical Engineers B30.5)
- telephones (use of a cellular phone)

All RMA site personnel will become familiar with both task-specific and site-wide standard and emergency communication signals at the orientation and training session held prior to the commencement of work on site.

7.3 *Medical Emergency Procedures*

An injury that requires only minor first aid need only be recorded on a first aid treatment log, which will be maintained on file and available for review. All other injuries or occupational illnesses must be investigated and the Accident/Injury Report Form located in Attachment 3. Employees are responsible for reporting any injuries or occupational illnesses to their supervisor, who must file a report.

The procedures listed in the following subsections outline the steps to be taken if an accident occurs.

7.3.1 Minor Injury

If a minor injury occurs, the following steps will be followed:

1. Have qualified first aid personnel treat injury.
2. Contact Task Foreman or buddy.
3. Complete required incident report forms and notify RMA HSM.
4. Record injury and include name of injured person, nature of injury, and treatment given.
5. Notify the Navy within 24 hours.

7.3.2 Serious Injury

In the event of a medical emergency when actual or suspected serious injury occurs, the following procedures will be implemented:

1. Survey scene and evaluate whether the area is safe for entry.
2. Remove the exposed or injured person(s) from immediate danger.
3. Render first aid if necessary. Decontaminate affected personnel after critical first aid is given.
4. Obtain paramedic services or ambulance transport to local hospital. The following procedure will be followed even if there is no visible injury:
   - Call 911 or Irvine Regional Hospital and Medical Center direct emergency room number (949) 753-2250 to elicit the fastest response
   - Identify location, request medical assistance, provide name and telephone number
   - Request assistance from emergency medical service or additional assistance
5. Other personnel in the work area will be evacuated to a safe distance until the Project Superintendent determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work will not commence until all hazard control issues are resolved.
6. Complete required incident report forms and notify Project HSM.
7. Notify the Navy of incident and fill out accident reporting forms included in Attachment 3.
8. Notify the Navy immediately.

7.3.3 Fatal Injury

If a fatal injury occurs, the following additional steps will be followed:

1. Notify immediate supervisor.
2. Notify Project HSM. Project HSM will initiate contact with Fed-OSHA and other appropriate agencies within 8 hours.
3. Notify the Navy immediately.
4. Stop all work activities on the project for 24 hours.
5. Assist Fed-OSHA as directed.

Any personnel requiring emergency medical attention will be evacuated immediately from the work zone. Personnel will not enter the area to attempt a rescue if their own lives would be at jeopardy. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life saving first aid. For others, decontamination may aggravate the injury or delay life saving treatment. If decontamination does not interfere with essential treatment, it should be performed.

If decontamination can be performed then take the following steps:

- Wash external clothing and cut it away.
- Wrap victim in clean blanket or towel, if necessary.

If decontamination cannot be performed:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures.
- Send along site personnel familiar with the incident.

7.3.4 First Aid

Only qualified personnel will give first aid and stabilize an individual needing assistance. Life support techniques such as cardiopulmonary resuscitation (CPR) and treatment of life threatening problems such as airway obstruction and shock will be given top priority. The HSO is current in the use of First Aid and CPR and will maintain a list of the other personnel certified in First Aid and CPR. Professional medical assistance will be obtained at the earliest possible opportunity. General first aid procedures are outlined below.

- Skin Contact: Wash/rinse the affected area with copious amounts of soap and water, then provide the appropriate medical attention. An eyewash station will be located in the decontamination area. Eyes affected by chemical contact will be washed/rinsed for 15 minutes.
- Inhalation: Move to fresh air and, if necessary, decontaminate and transport to hospital. Any loss of consciousness or exposure to airborne toxic substances, even if the individual appears to have fully recovered, will require immediate treatment or surveillance by a qualified physician.
- Ingestion: Notify Poison Control Center and emergency medical facility and transport to nearest emergency medical facility immediately.
- Puncture Wound or Laceration: Decontaminate and transport to emergency medical facility. Apply direct compression to stop or slow the flow of blood. Universal precautions, in order to prevent contacting the blood of another, shall be implemented

To provide first-line assistance to field personnel in the case of sickness or injury, the following items will be immediately available:

- first aid kit.
- supply of clean water.
- blanket.

The location of the above items will be established prior to beginning work and will be discussed in detail at the site safety orientation meeting.

7.4 Spill Response Procedures

RMA anticipates a low potential risk of leaks of hazardous materials. If such spills did occur, it is believed that only small amounts of these materials would be released. However, because there is a potential for a spill to occur, the appropriate spill response materials will be available.

In the case of a spill of contaminated or hazardous materials, the following procedures will be followed:

1. Determine a spill has occurred.
2. Notify the Project Superintendent.
3. Identify protective clothing or equipment required to respond.
4. Contain the spill.
5. Notify the Navy.
6. Neutralize and/or solidify any product.
7. Transfer material into 55-gallon drums.
8. Document incident.

7.4.1 Release Prevention and Minimization Measures

In addition to training, the following procedures will be implemented to prevent and minimize releases of hazardous materials:

- Do not conduct hazardous materials operation when the weather could cause significant risk to surrounding area if a spill should occur.
- Transfer all materials in or over a bermed or protected area. A protected area is one which is covered with an impermeable material, such as polyethylene.
- Dike temporary storage tanks containing hazardous wastes or potentially hazardous wastes to contain potential releases.

- Maintain a supply of basic spill response materials and protective equipment on site to include the following:
  - -- absorbent sheets, pillows, booms or absorbent material
  - -- open top 55-gallon drums or other containers with lids
  - -- brooms, shovels and other tools, such as squeegees

7.4.2 Emergency Coordinator

The Project Superintendent is the primary emergency coordinator for all spills on this project.

7.5 Earthquake Response

If an earthquake should occur during the course of site activities, take the following steps:

1. Remain calm and do not panic.
2. Stop working.
3. If indoors, stay indoors away from windows and take cover under heavy furniture or inside walls if possible.
4. If outdoors, stay away from power lines, power poles, and windows.
5. If in a vehicle, stay in the vehicle until the earthquake is over.
6. Do not use or do anything that might be a source of ignition, i.e., smoking, cutting, or welding.

After the earthquake is over take the following steps:

1. Personnel should meet for a head count at a location designated by the Project Supervisor.
2. Check for injuries. Do not move seriously injured personnel unless remaining where they are would create danger of further injury.
3. Check vehicles, equipment, and buildings for any obvious damage.
4. Check utility lines for damage. Switch off power, water and gas until a utility official has inspected the building and determined it is safe.
5. If driving, watch carefully for hazards created by the earthquake, i.e., undermined roads, weak bridges or overpasses, etc.
6. Prepare for after shocks. Stay out of severely damaged buildings.

7.6 Fire or Explosion Response

In the event of a fire or explosion, the fire department will be summoned immediately with a head count and evacuation procedures taking place concurrently. Upon the fire departments arrival, the Project Superintendent, Project Manager, or designated alternate will advise the Fire Commander of the location and nature of the fire and identify any hazardous materials on site.

Upon approval of the Project Superintendent or HSO, and if it can be done safely, site personnel may do the following:

- use fire extinguishers available on site to control or extinguish small localized fire
- remove or isolate flammable or other hazardous materials that may contribute to the fire
- begin containment and recovery of the spilled materials

Dry chemical portable fire extinguishers (ABC type) will be provided at the work location and in the immediate area where flammable materials are stored.

7.7 Site Evacuation Plan

When site personnel are alerted to an evacuation of the site, the alarm procedures listed below will be implemented. The primary and secondary meeting area will be established on a site-specific basis during the morning safety briefing. A head count will be completed by the Project Superintendent at the meeting area and further directions or response discussions will be coordinated at that point.

In the general case of a large fire, explosion, or toxic vapor release, a site evacuation will be ordered and the following steps will be taken:

1. Sound the applicable alarm and advise the NTR.
2. Evaluate the immediate situation and downwind direction. All personnel will evacuate in the upwind direction.
3. All personnel will assemble in an upwind area when the situation permits, a head count will be taken.
4. Determine the extent of the problem. Dispatch a response team on site to evacuate any missing personnel or to correct the problem if this can be done safely and with no risk to the H&S of the response team members.

The above procedures will apply to all RMA subcontractors and will be discussed with them prior to the commencement of work.

7.8 *Emergency and Hospital Information*

A map to the hospital (Figure 7-2) and emergency telephone numbers (Table 2-1) will be posted on site and in each vehicle. The directions to the hospital are listed below.

DIRECTIONS TO THE HOSPITAL

Hospital	Directions
Irvine Regional Hospital 16200 Sand Canyon Avenue Irvine, CA. 95382 (949) 753-2250	Evacuation location is the bases northwest exit located on Trabuca Road. Turn left onto Sand Canyon Ave. Proceed approximately 2 miles south to the Irvine Regional Hospital.

8.0 SPILL AND DISCHARGE CONTROL PLAN

The Spill and Discharge Control Plan has been developed to prevent the contamination of soils, water, atmosphere, uncontaminated areas/surfaces, equipment or material by the uncontrolled release of hazardous waste and materials during the monitoring well abandonment.

The following spill control equipment will be available in the event of a spill of liquid or solid waste:

- Sand or other appropriate spill absorbent material.
- 55-gallon drums.
- Shovels.
- Decontamination supplies and protective clothing.

Regardless of the type of spill (liquid or solid), the following measures will be taken to isolate the spilled material(s):

- Isolate and contain the hazardous spill area.
- Restrict access of unauthorized personnel.
- Prevent contact with the spilled material.
- Relocate upwind and up gradient of the spilled material.
- Take air, soil, or appropriate samples to determine if clean up is complete.

Liquid spills should be adsorbed with sand or other appropriate absorbent material. The absorbent material will be incorporated into the contaminated stockpiled soil. The final disposition of the absorbent material will be determined in conjunction with the stockpiled soil.

In the event of a discharge of liquid into the soil, RMA will immediately identify the location of the discharge and take appropriate remedial actions to eliminate further spillage. The discharged liquid material will be controlled and disposed of as described above.

9.0 MEDICAL SURVEILLANCE

9.1 Medical Examination Requirements

All RMA and Subcontractor project personnel working on-site will have undergone either a baseline or annual medical monitoring examination within 11 months prior to participation in field work.

9.1.1 Contents of the Medical Examination

Medical screening is conducted at the start of employment and annually thereafter, and may consist of the following:

- Medical and occupational history*
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood forming, hepatic, renal, and nervous systems
- Urinalysis
- blood analysis
- pulmonary function test*
- chest X-ray*
- Electrocardiogram*

* For baseline medical screening. May not occur annually.

Based on this examination, the physician will certify in writing whether the individual is capable of full participation in the program, or whether that person must work within certain restrictions. Personnel may be excluded from this project for medical reasons.

Any person exposed to high levels of hazardous substances will be required to undergo a repeat medical surveillance examination at, or if necessary, before the conclusion of the project to determine the medical implications of the exposure. Any person suffering a lost-time injury or illness must have medical approval prior to returning to work on-site.

9.2 Record Keeping

All medical records must be maintained by the employer for a period of at least 30 years after the employee's termination of employment, in accordance with OSHA regulations on confidentially and record keeping.

10.0 TRAINING

This section states the specific training requirements for the project consistent with 29 CFR 1910.120(e). This site-specific training will include the following:

- names of personnel and alternates responsible for site safety and health.
- safety, health, and other hazards present on the site.
- using protective clothing and equipment, specific to the site
- work practices by which the employee can minimize risks from hazards.
- safe use of engineering controls and equipment on the site.
- medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards.
- decontamination procedures.
- emergency response procedures.
- refresher training requirements.

10.1 Training Prerequisites

It is stated in 29 CFR 1910.120 that personnel who enter an area covered under the regulation have a minimum of 40 hours training and 3 days supervised field experience. All personnel who enter the exclusion zone or CRZ are required to have this training. Personnel must have had the 8-hour annual refresher training to maintain currency in Hazardous Waste Operations as prescribed by this regulation. Furthermore, all supervisors will have had an 8-hour Supervisors H&S Management Course. The HSO will also meet the training requirements presented in EM 385-1-1 including having completed the 10 hr OSHA Construction Safety Course within the last three years and be trained in first aid and CPR. The HSO will ensure that all training, fit tests and medical certification records are available on-site at all times for RMA and subcontractor employees.

10.2 Daily Safety Meetings

Daily tailgate safety meetings are held at the start of each shift, prior to the day's remediation activity, in which potential chemical, physical, and environmental hazards and preventive safety measures are discussed. AHA briefings are held prior to the commencement of a new task where

task-specific risks and precautions are discussed. Attendance is mandatory and is documented (See pgs. 3-1 and 3-12). Daily safety meeting logs are to be submitted with the Daily Reports.

11.0 REFERENCE SOURCES

Occupational Safety and Health Standards, *Title 29 CFR Parts 1910 and 1926, U.S. Department of Labor, Occupational Safety and Health Administration* (OSHA).

Occupational Safety and Health Administration (OSHA) Standards: *Title 29 Code of Federal Regulations (CFR) Sections 1910.1001 and 1926.58 (as amended), 1910.134, 1910.20 and 1910.1200.*

U.S. Environmental Protection Agency (EPA) Standards; *Title 40 CFR, Part 61, Subpart M; Title 40 CFR, Part 763, Subpart E; Title 40 CFR Part 763, Subpart G.*

OSHA Standards for Hazardous Waste Operations and Emergency Response, *Final Rule. 29 CFR 1910.120 54 FR 9294, March 6, 1989*

OSHA Air Contaminants: *Permissible Exposure Limits (PELs) 29 CFR 1910.1000 54 FR 2332,* January 19, 1989.

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Occupational Diseases, A Guide to their Recognition, USDHEW (1977)

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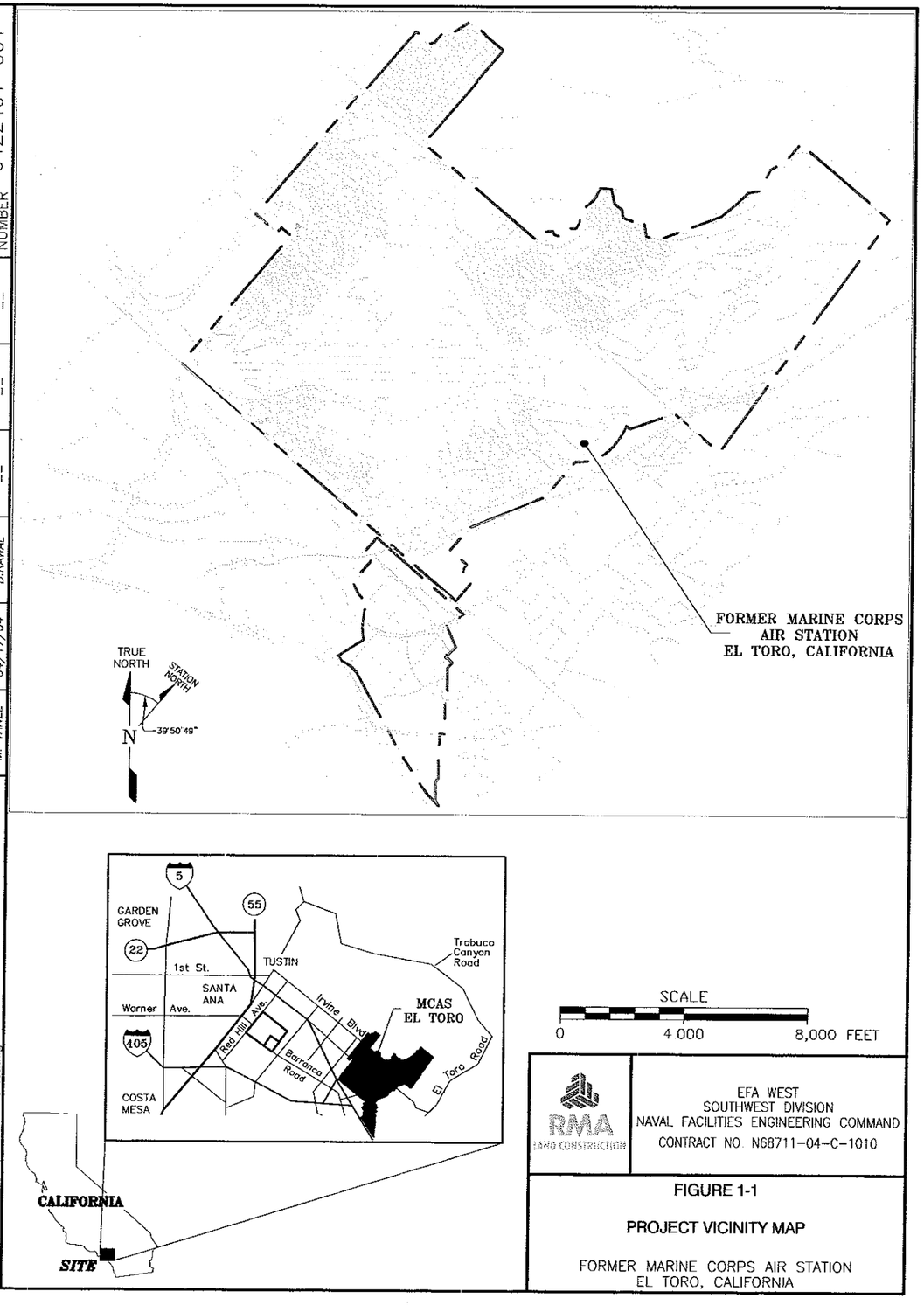
FIGURES



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
M. YANEZ 04/17/04	D.RAWAL --	-- --	0422401-001

RMA LAND CONSTRUCTION

EFA WEST
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-04-C-1010

FIGURE 1-1

PROJECT VICINITY MAP

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

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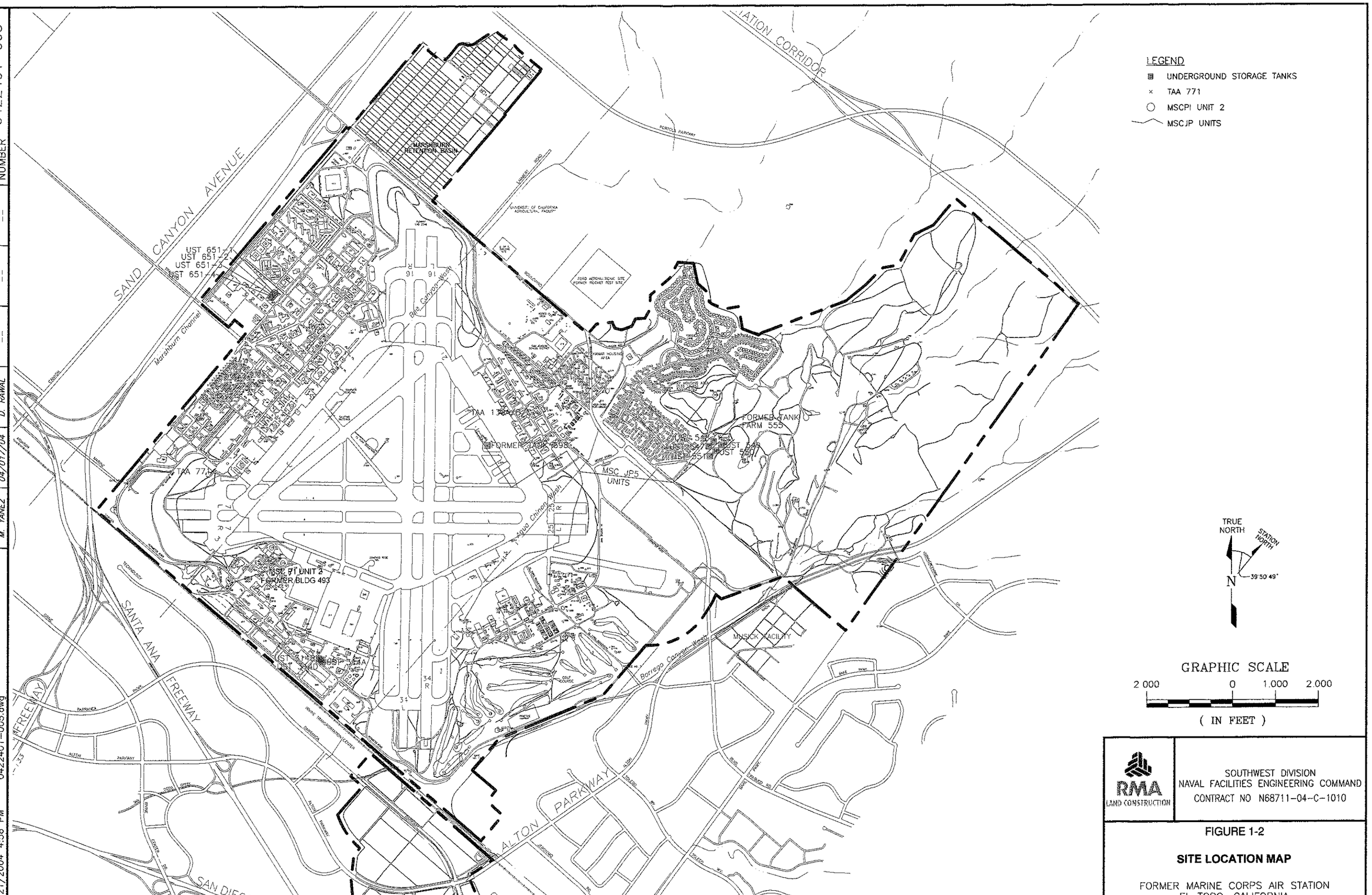

RMA LAND CONSTRUCTION

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO N68711-04-C-1010

FIGURE 1-2

SITE LOCATION MAP

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

DRAWING NUMBER 0422401-005
APPROVED BY --
CHECKED BY D. RAWAL
DRAWN BY M. YANEZ 04/017/04

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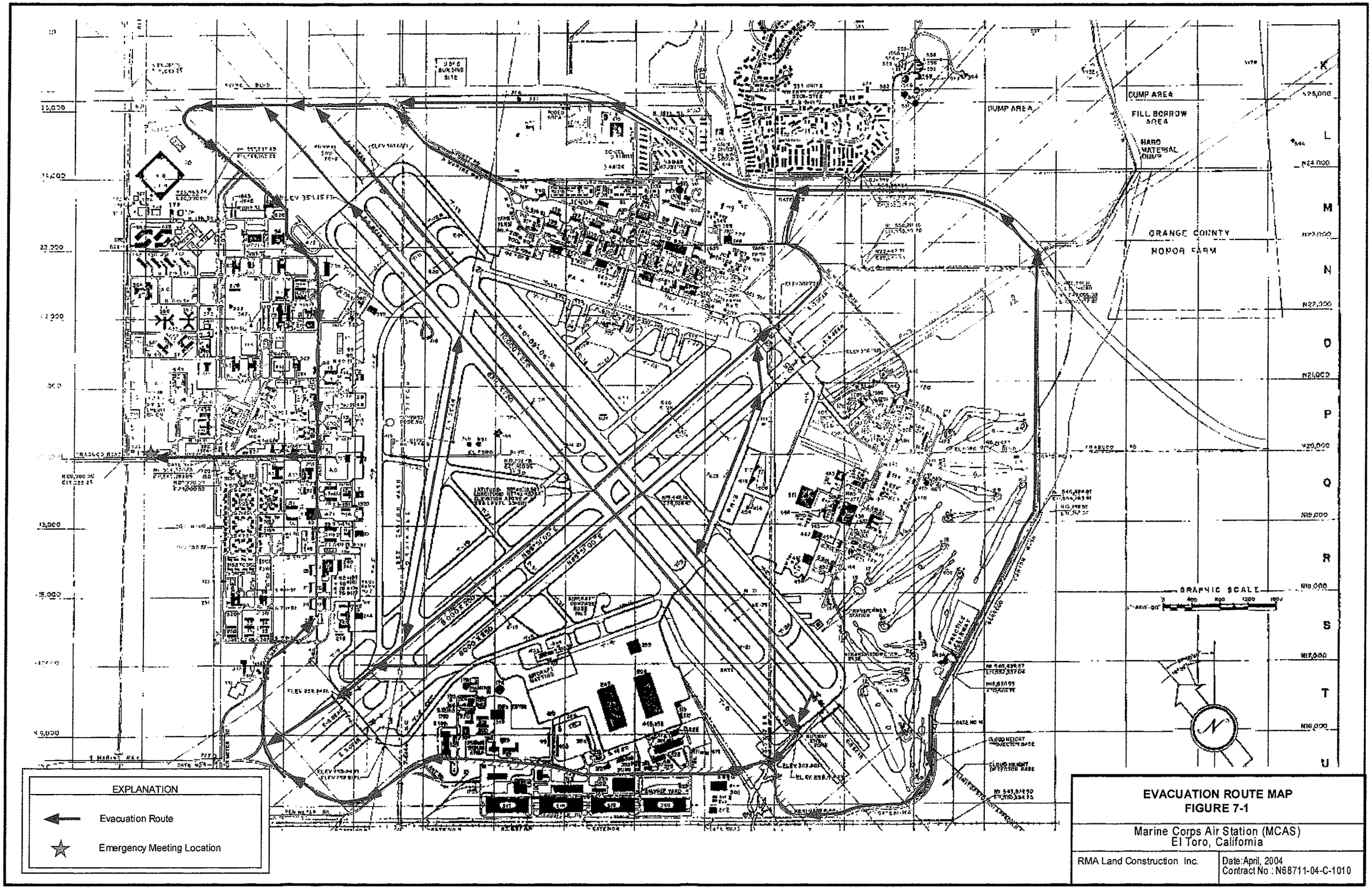
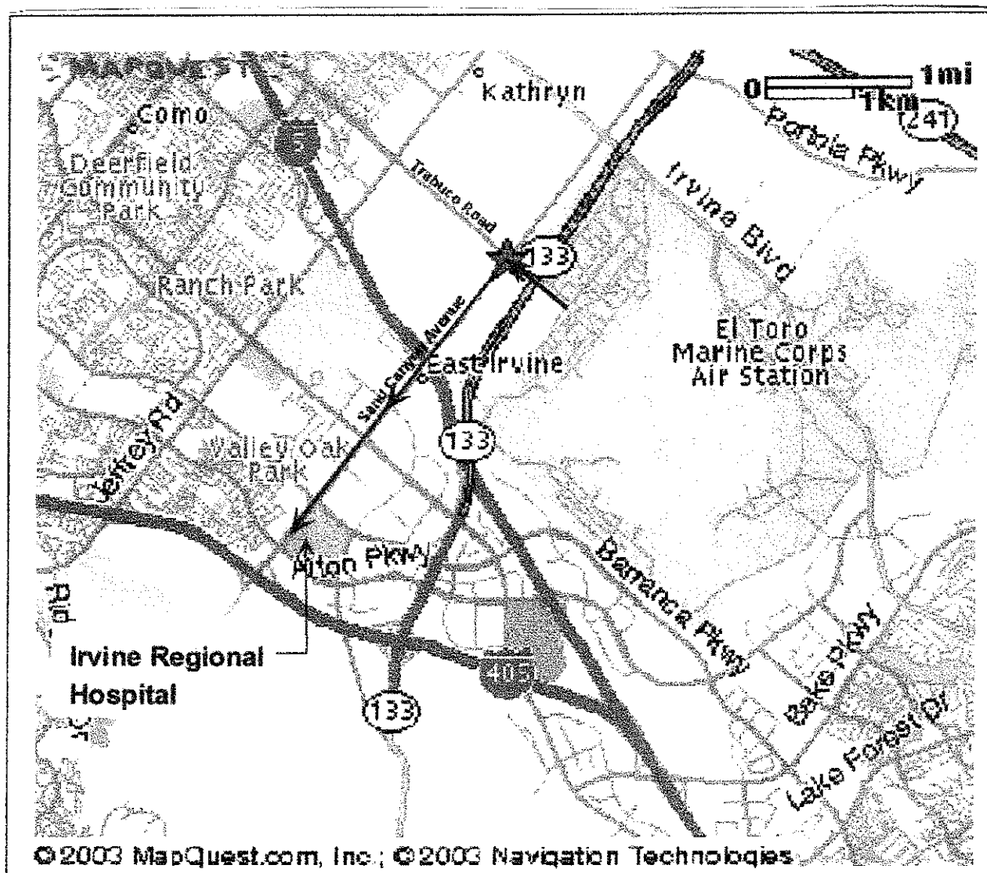


EVACUATION ROUTE MAP
FIGURE 7-1

Marine Corps Air Station (MCAS)
El Toro, California

RMA Land Construction Inc.

Date: April, 2004
Contract No : N68711-04-C-1010



★ - Emergency Meeting Location

Route to Hospital from Base Evacuation Location:
Evacuation Location is Bases Northwest exit located on Trabuco Road
Exit MCAS, El Toro on Trabuco Road, Turn Left onto Sand Canyon Ave
Proceed approximately 2 miles south to the Irvine Medical Center

Hospital Address and Telephone:
Irvine Regional Hospital and Medical Center
16200 Sand Canyon Avenue
Irvine, CA 92618
ER Operator (949) 753-2250

See Figure 7-1 for MCAS, El Toro Evacuation Routes

N

Reference: Map Provided by Mapquest.com

ROUTE TO HOSPITAL MAP FIGURE 7-2	
Former Marine Corps Air Station, El Toro, California	
RMA Land Construction, Inc.	Date: April, 2004 Contract No.: N687-04-R-1010

TABLES

TABLE 2-1
EMERGENCY PHONE NUMBERS

Emergency Services		
Fire Department		911
Sheriffs (Main Gate)		Land Line (949) 654-2981
		Cellular (949) 279-8261
Ambulance Service		911
Poison Control Center		(800) 222-1222
Department of Environmental Services		(800) 258-6942
National Response Center		(800) 424-8802
Hospital		
Irvine Regional Hospital		(949) 753-2000 Administration
		(949) 753-2250 Emergency Room
RMA, Inc.		
Steve Mohammad*	Project Manager	Office: (714) 985-2888
		Fax: (714) 985-2889
		Cell: (714) 981-0773
		e-mail: aqeelm@rmaland.com
Dr. Maureen Sassoon, C.I.H	HSM	Office: (310) 544-2912
Sean Moncrief*	HSO/Project Engineer	Office: (714) 985-2888
		Cell: (310) 994-9040
		e-mail: seanm@rmaland.com
Navy ROICC		
Scott Kehe	ROICC	Office (949) 726-2506
Ed Nunn	CSO	(619) 572-1404
Navy Contacts		
Lynn Hornecker	RPM, SWDIV	Office: (619) 532-0783
		Fax: (619) 532-0780
		e-mail: lynn hornecker@navy mil
Gracy Tinker	CS, SWDIV	Office: (619) 532-0782
		Fax: (619) 532-0780
		e-mail: gracy.tinker@navy.mil
Regulatory Agencies		
Arghavan Rashidi-Fard	OCHCA	Office (714) 667-3713
John Broderick	CRWQCB, Santa Ana	Office: (909) 782-4494

Notes:

*: RMA personnel trained in First Aid

TABLE 3-1
CHEMICAL HAZARD ASSESSMENT

Chemical Name	PEL/TLV	Route of Exposure	Signs and Symptoms of Exposure
Aldrin	PEL = 0.25 mg/m^3 TLV = 0.25 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [potential occupational carcinogen]
Arsenic	PEL = 0.01 mg/m^3 TLV = 0.01 mg/m^3	Inhalation Ingestion Skin and/or eye contact Skin absorption	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]
Benzene	PEL = 1 ppm (s) TLV = 0.5 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritates eyes, skin, nose, respiratory system; giddiness; headache, nausea; dermatitis; bone marrow depression. Carcinogenic.
Carbon Tetrachloride	PEL = 2 ppm (s) TLV = 10 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritation, digestive disorders, headache, symptoms of drunkenness, lung congestion, kidney damage, liver damage, effects on the brain, convulsions, coma
Chlordane	PEL = 0.5 mg/m^3 TLV = 0.5 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria; in animals: lung, liver, kidney damage; [potential occupational carcinogen]
Chloroform	PEL = 2 ppm TLV = 10 ppm	Inhalation Ingestion	Irritating to eyes, skin and respiratory tract. Moderately toxic. Target organs are the central nervous system, liver and kidney.
DDT	PEL = 1 mg/m^3 TLV = 1 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]
Dieldrin	PEL = 0.25 mg/m^3 TLV = 0.25 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage
Diesel engine emissions (diesel exhaust – No_{x1} CO, carcinogenic compounds)	PEL = NA TLV = 0.15 mg/m^3 (NIC)	Inhalation Skin and/or eye contact	Eye irritation; pulmonary function changes; carcinogen.

TABLE 3-1 (Continued)
CHEMICAL HAZARD ASSESSMENT

Chemical Name	PEL/TLV	Route of Exposure	Signs and Symptoms of Exposure
Diesel fuel	PEL = NA TLV = 100 mg/m^3 (skin) (NIC)	Inhalation Ingestion Skin and/or eye contact	Ingestion causes nausea, vomiting, and cramps; CNS depression, headache, coma, death. Inhalation causes pulmonary irritation, lightheadedness. Aspiration causes severe lung irritation, coughing pulmonary edema. Irritant to skin and mucous membranes.
Endosulfan	PEL = NA TLV = 0.1 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritation skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache; in animals: kidney, liver injury; decreased testis weight
Endrin	PEL = 0.1 mg/m^3 TLV = 0.1 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Epileptiform convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude (weakness, exhaustion); anorexia; in animals: liver damage
Ethylbenzene	PEL = 100 ppm TLV = 100 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritation of the eyes, mucous membranes, dermatitis, headache, narcosis, coma.
Gasoline	PEL = 300 ppm TLV = 300 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Intoxication, headaches, blurred vision, dizziness, nausea; eye, nose, and throat irritation. Carcinogenic (benzene).
Heptachlor	PEL = 0.5 mg/m^3 TLV = 0.05 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	In animals:tremor, convulsions; liver damage; [potential occupational carcinogen]
Malathion	PEL = 15 mg/m^3 TLV = 10 mg/m^3 (skin)	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritation eyes, skin; miosis, aching eyes, blurred vision, lacrimation (discharge of tears); salivation; anorexia, nausea, vomiting, abdominal cramps, diarrhea, dizziness, confusion, ataxia; rhinorrhea (discharge of thin mucus), headache; chest tightness, wheezing, laryngeal spasm
Methoxychlor	PEL = 15 mg/m^3 TLV = 10 mg/m^3 (skin)	Inhalation Ingestion	In animals: fasciculation, trembling, convulsions; kidney, liver damage; [potential occupational carcinogen]

TABLE 3-1 (Continued)
CHEMICAL HAZARD ASSESSMENT

Chemical Name	PEL/TLV	Route of Exposure	Signs and Symptoms of Exposure
MTBE	PEL = 40 ppm TLV = 40 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritation to the nose, throat, lungs and respiratory tract Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.
Perchlorate	PEL = NE TLV = NE	Inhalation Ingestion	Irritating to the skin and eyes on contact. Inhalation will cause irritation to the lungs and mucus membrane Irritation to the eyes will cause watering and redness. Reddening, scaling, and itching are characteristics of skin inflammation.
Petroleum Hydrocarbons (Examples: oils, and grease)	NA	Inhalation Ingestion Skin and/or eye contact Skin absorption	Irritated skin, eyes, nose, and throat; headache, dizziness; dermatitis; some components of gasoline and diesel exhaust are carcinogenic.
Toluene (toluol, methyl benzene)	PEL = 50 ppm(s) TLV = 50 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Fatigue, weakness; confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscular fatigue, insomnia; paralysis; dermatitis.
Xylene (o-, m-, and p-isomers)	PEL = 100 ppm TLV = 100 ppm	Inhalation Ingestion Skin and/or eye contact Skin absorption	Dizziness, excitement, drowsiness, staggering gait; irritated eyes, nose, throat; cornmeal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.

Explanation:
µg/m3 - micrograms per cubic meter
CNS – central nervous system
mg/m3 – milligrams per cubic meter
MSDS – Material Safety Data Sheet
NA – not applicable or not available
NE – not established
NIC – Notice of Intended Change (ACGIH)
OSHA – Occupational Safety and Health Administration
ppm – parts per million
TLV/PEL - threshold limit value/permissible exposure limit
VOC – volatile organic compound

References:
Guide to Occupational Exposure Values – 2002, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).
Micromedex Tomes Plus ® System, 1995, Micromedex, Inc.
Pocket Guide to Chemical Hazards, Pub. No 97-140. January 2003, National Institute for Occupational Safety and Health (NIOSH).
Odor Threshold for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association (AIHA), 1989.
Workplace Environmental Exposure Levels, American Industrial Hygiene Association (AIHA), 1995.

TABLE 3-2
Known Concentration in Soil and Water

Chemical Name	Maximum Concentration in Soil	Maximum Concentration in Water[a]
Aldrin	0.023 (J) mg/m^3	NA
Arsenic	13 mg/m^3	NA
Benzene	3,000 - 7,000 mg/m^3	1000 µg/l
Chlordane	0.15 (J) mg/m^3	NA
DDT	27 (J) mg/m^3	NA
Dieldrin	0.06 (J) mg/m^3	NA
Diesel fuel	3,000 - 7,000 mg/m^3	1000 µg/l
Endosulfan	0.14 (J) mg/m^3	NA
Endrin	0.033 (J) mg/m^3	NA
Ethylbenzene	3,000 - 7,000 mg/m^3	1000 µg/l
Gasoline	3,000 - 7,000 mg/m^3	1000 µg/l
Heptachlor	0.21 (J) mg/m^3	NA
Malathion	10 $\mu g/m^3$	NA
Methoxychlor	3 (J) mg/m^3	NA
MTBE	3,000 - 7,000 mg/m^3	1000 µg/l
Toluene	3,000 - 7,000 mg/m^3	1000 µg/l
Xylene	3,000 - 7,000 mg/m^3	1000 µg/l

[a] - approximate value

Explanation:
µg/m3 - micrograms per cubic meter
mg/m3 – milligrams per cubic meter
µg/l - micrograms per cubic liter
NA – not applicable or not available
DDT – Dichlorodiphenyltrichloroethane
MTBE – Methyl Tertiary Butyl Ether
J – Estimated Concentration

TABLE 5-1
PERSONAL PROTECTIVE EQUIPMENT

Task	EPA Level	Respiratory Protection	Head	Hands	Body	Boots	Face	Eye	Hearing	Special Requirements
Mobilization/ Demobilization	D	None	Hard Hat	Leather or cotton work gloves, as needed	None, unless Tyvek™ coveralls to keep clean	Steel-toed boots	Not applicable	Safety glasses	Ear plugs required for high noise area (>85 dBA)	Not applicable
Utility Clearance and Site Survey	D	None	Hard Hat	Leather or cotton work gloves, as needed	None, unless Tyvek™ coveralls to keep clean	Steel-toed boots	Not applicable	Safety glasses	Ear plugs required for high noise area (>85 dBA)	Not applicable
Drilling	D	Not applicable, unless air monitoring indicates a need to upgrade	Hard Hat	Leather or cotton work gloves, as needed. 11-mil nitrile over 8-mil N-Dex™ gloves when taking samples	None, unless Tyvek™ coveralls to keep clean	Steel-toed boots	Not applicable	Safety glasses	Ear plugs required for high noise area (>85 dBA)	See Table 5-2 for PPE upgrade action levels
Sampling by Direct Push Techniques	Modified D	Not applicable, unless air monitoring indicates a need to upgrade	Hard Hat	11-mil nitrile over 8-mil N-Dex™ gloves when taking samples	None, unless Tyvek™ coveralls to keep clean	Steel-toed	Not applicable	Safety glasses	Ear plugs required for high noise area (>85 dBA)	See Table 5-2 for PPE upgrade action levels
Hand Auguring-Excavation	D	Not applicable, unless air monitoring indicates a need to upgrade	Hard Hat	Leather or cotton work gloves, as needed. 11-mil nitrile over 8-mil N-Dex™ gloves when taking samples	None, unless Tyvek™ coveralls to keep clean	Steel-toed boots	Not applicable	Safety glasses	Ear plugs required for high noise area (>85 dBA)	See Table 5-2 for PPE upgrade action levels
Sampling of Groundwater - Purging Wells	Modified D	Not applicable, unless air monitoring indicates a need to upgrade	Hard Hat	11-mil nitrile over 8-mil N-Dex™ gloves	None, unless Tyvek™ coveralls to keep clean	Steel-toed with rubber boot covers	Not applicable	Safety goggles	Ear plugs required for high noise area (>85 dBA)	See Table 5-2 for PPE upgrade action levels
Equipment Decontamination	Modified D	Not applicable, unless air monitoring indicates a need to upgrade	Hard Hat	11-mil nitrile over 8-mil N-Dex™ when handling liquids or taking samples	Saranex™ coveralls or PVC rainsuit to keep dry	Steel-toed with rubber boot covers	Face shield	Face shield	Ear plugs required for high noise area (>85 dBA)	Metatarsal shin and foot guards when operating pressure washers in excess of 1000 psi

Explanation
dBA - decibels A-scale
EPA - United States Environmental Protection Agency
mg/m³ - milligrams per cubic meter
PID - photoionization detector
ppm - parts per million
psi - pound per square inch

TABLE 5-2
Action Levels

Contaminate	Action Level[a]	Required Action
Dust	Up to 5 mg/m^3 BZ	Level D
	> 5 mg/m^3 BZ	Increase dust suppression efforts and/or upgrade to level C
VOCs	> 5 to 100 ppm BZ	Level D, Detector tube for benzene
(Petroleum Hydrocarbons)	> 100 to 500 ppm BZ	Upgrade to Level C, determine source, if feasible use engineering controls
	> 500 ppm BZ	Stop work, contact CIH
Benzene	up to 1 ppm BZ	Level D
	1 to 5 ppm BZ	Upgrade to Level C
	> 5 ppm BZ	Stop work, contact CIH
Pesticides/Herbicides	Up to 0.1 mg/m^3 BZ	Level D
	> 0.1 mg/m^3 BZ	Stop work, contact CIH
O2	< 19.5% or > 23.5%	Stop work; increase ventilation, contact CIH
LEL	> 10% LEL	Stop work; increase ventilation, contact CIH

[a] *Five excursions above the action level in any 15-minute period or a sustained reading in excess of the action levels for 5 minutes will trigger a response*

Explanation:
BZ – breathing zone
mg/m3 – milligrams per cubic meter
CIH – Certified Industrial Hygienist
LEL – Lower Explosive Limit
ppm – parts per million
VOC(s) – volatile organic compound(s)

ATTACHMENT 1

HAZARD ANALYSIS FORMS

ACTIVITY HAZARD ANALYSIS #1

Activity: Mobilization/Demobilization **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas.	Potential exposure to chemical hazards.	• Delineate exclusion zones, and use PPE specified in SHSP. • Visual observation shall be used to verify selection of PPE. • Identify all chemical hazards and receive training (MSDS) regarding safe handling of chemicals. The SHSS will file copies of all MSDSs at the site.
	Excessive noise exposure could cause hearing loss.	• Hearing protection is required when sound levels exceed 85 dBA continuously.
	Biological hazards such as snakes, insects, or spiders could cause injury or bites.	• Wear PPE. • Look carefully for snakes, insects, and spiders before stepping into any area or before placing hands near the ground. • Use insect repellant as necessary.
	Slip, trip, and fall hazards.	• Work areas shall be visually inspected, and slip, trip, and fall hazards shall be marked, barricaded, or eliminated, if feasible. Use care in work area; look for depressions and obstructions. • Look out for ground squirrel holes throughout the area. • Employees shall only be allowed to work on walking/working surfaces that have the strength and integrity to support employees safely. Walking/working surfaces for this requirement include the edges of trenches. • Employees performing work on a walking/working surface with an unprotected side or edge that is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems. • Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded.

ACTIVITY HAZARD ANALYSIS #1

Activity: Mobilization/Demobilization **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas (continued).	Sharp objects/punctures.	• Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. • Workers should not stand or walk on equipment or supplies.
	Strains from manually moving materials and equipment.	• Personnel will be trained to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck shall be encouraged. • Employees will not lift more than 50 pounds without assistance. • Pre-employment back evaluations are recommended for craft workers, who may be at greater risk of developing low back pain or low back injury. • Surveys shall be performed by persons qualified to identify and evaluate tasks that might result in injuries due to ergonomic hazards. The focus of the surveys will be operations which involve manual lifting of and moving excessively heavy or asymmetric objects. • Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, and/or pressing with hand and fingers.
	Exposure to extreme temperatures.	• Monitor for heat stress referenced in the SH&SP. Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously.

ACTIVITY HAZARD ANALYSIS #1

Activity: Mobilization/Demobilization **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas (continued).	Eye hazards.	• Safety glasses are the minimum required eye protection for all work areas.
	Lack of communication in widely dispersed areas could cause inability of personnel to respond to an emergency in a timely fashion. Also, lack of communication could cause injury to workers or damage to property because workers were not able to coordinate their work activity or adequately warn others.	• Ensure that each work team has a telephone, a two-way radio, or access to a telephone for communication. • If more than one team is working at a time, ensure that there is communication between the work teams and project management. Workers must work in teams of two or more. Each team must use the buddy system. • Check cellular phone communications, as there are many "dead" spots in this area.
	Power and hand tools when used improperly could injure workers. Electrocution from power tools that are not grounded.	• Inspect all tools before each use. Discard or tag out any tool that is not safe, has broken handles, patched handles, missing guards, and so forth. • Personnel will be trained in the proper use of hand and power tools. • If power tools are connected to power sources other than batteries, the tools will be grounded or double-insulated and connected to a GFCI outlet. • If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow the manufacturer's directions. EM 385-1-1, Table 11-2 or NEC 250-6 lists the exceptions for grounding portable and vehicle-mounted generators.

ACTIVITY HAZARD ANALYSIS #1

Activity: Mobilization/Demobilization **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas (continued).	Struck by or against vehicles.	• Wear high-visibility reflective vests at all times in the work area. • Make eye contact with vehicle operators. • Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities, as necessary.
	Material handling could cause injury to workers by getting parts of the body caught between material being handled.	• Identify and avoid pinch points. • Maintain communication with others involved in material handling. • Use appropriate PPE.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles, equipment, hand tools.	Daily and before use. Use the equipment safety checklist found in the	• Only DMV-licensed personnel will operate vehicles. • Specific training for power tools and hand tools will be provided.

Notes:

CIH - Certified Industrial Hygienist
dBA - decibels, A-scale
DMV - Department of Motor Vehicles
EHS - Environmental Health and Safety
EM - Engineer Manual (US Army Corps of Engineers)
GFCI - ground fault circuit interrupter
MSDS - Material Safety Data Sheet
NASA - National Aeronautics and Space Administration
NEC - National Electrical Code
PPE - personal protective equipment
SHSS - Site Health and Safety Specialist

ACTIVITY HAZARD ANALYSIS #2

Activity: Utility Clearance/Site Survey **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Utility Clearance/Survey site	Slips, trips, and falls from various agents.	• Work areas will be visually inspected and pre-existing slip, trip, and fall hazards will be marked, barricaded, or eliminated as is feasible. • Work areas will be kept neat and in an orderly state of housekeeping. • Proper illumination will be maintained in work areas. • Look out for ground squirrel holes throughout the area.
	Biological hazards such as snakes, insects, or spiders could cause injury or bites.	• Wear PPE. • Look carefully for snakes, insects, and spiders before stepping into any area or before placing hands near the ground. • Use insect repellant as necessary.
	Strains from manually moving materials and equipment.	• Personnel will be trained to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck shall be encouraged. • Employees will not lift more than 50 pounds without assistance.
	Failure to properly survey site could cause exposures to electrical hazards and ground hazards.	• Conduct survey properly to identify all overhead electrical hazards, including electrical hazards in the path of the equipment as it being transported. • Ensure that ground has no hazards such as unstable soil, or underground utilities • Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.

ACTIVITY HAZARD ANALYSIS #2

Activity: Utility Clearance/Site Survey **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Utility Clearance/Survey site (Continued)	Struck by or against vehicles.	• Wear high-visibility reflective vests at all times in the work area. • Make eye contact with vehicle operators. • Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities, as necessary.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Vehicles, equipment, hand tools.	Daily and before use. Use the equipment safety checklist found in Attachment 3.	• Only DMV-licensed personnel will operate vehicles. • Specific training for power tools and hand tools will be provided.

Notes:

CIH - Certified Industrial Hygienist
DMV - Department of Motor Vehicles
PPE - Personal protective equipment

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Survey site	Slips, trips, and falls from various agents.	• Work areas will be visually inspected and pre-existing slip, trip, and fall hazards will be marked, barricaded, or eliminated as is feasible. • Work areas will be kept neat and in an orderly state of housekeeping. • Proper illumination will be maintained in work areas.
	Failure to properly survey site could cause exposures to electrical hazards and ground hazards.	• Conduct survey properly to identify all overhead electrical hazards, including electrical hazards in the path of the equipment as it being transported. • Ensure that ground has no hazards such as unstable soil, or underground utilities • Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.
Drilling operations - Inspection of Drill Rig	Improper inspection of rig could cause workers to be exposed to hazards associated with operating and mechanical device.	• The rig and all associate equipment will be inspected by a competent mechanic and be certified to be in safe operating condition. • Equipment will be inspected before use and the beginning of each shift. • Faulty or unsafe equipment will be tagged and removed from service. No faulty equipment or damaged items will be allowed in the work area. • Per EM-385-1-1; Section 16.M.06, assure that drilling equipment be equipped with two easily accessible emergency shutdown devices, one for the operator and one for the helper. • Inspect the brakes and tire pressure on the drill rig. • Inspect all cables on the rig. • Inspect all hydraulic and pneumatic hoses.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations - Set up work area and move rig into position	Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damaging of underground utilities, tip over of rig in unstable soil conditions.	• A site layout plan will become part of this hazard analysis as soon as it is completed. • The drilling rig will not be moved into any work area until the site layout plan has been completed and the route of travel to any work site has been assessed for hazards (overhead lines, stability of roads and ground). • The site layout plan and the analysis of the route of travel will be covered at the pre-activity safety briefing along with this activity hazard analysis.
	Damage to existing utilities.	• Personnel will contact service facilities engineer before working near utilities. • Ensure that Underground Services Alert has been contacted. • Permit will be obtained through the OCHCA, prior to any drilling. • Assure that weight of rig on ground is evenly distributed and is not so heavy as to damage any underground lines that may be near the surface.
	Rig could contact overhead lines, including power lines if it is transported with rig raised.	• Never move rig when mast is extended.
	When raising rig, rig may not install properly due to the condition of rig and connecting cables.	• Inspect all components of rig to determine condition. • Make all repairs before raising rig.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations – Set up work area and move rig into position (Continued)	When raising rig, mast could come in contact with or close proximity to overhead power lines causing electrocution of workers.	• Mast and other equipment must be at least 15 feet from any overhead utility lines. • Verify the voltage of any overhead power lines. If any lines are above 50kV, the clearance distance must be greater. Refer to the EM 385-1-1, Section 11, Table 11-1 for clearance required for voltages above 50kV.
	Vehicle may move if not properly set up.	• Use spotter to properly position vehicle. • Set brakes and place wheel chocks under front wheels of mobile rig. • Extend stabilizer jacks and ensure that footing is sound. • Vehicle must be level to the vertical and horizontal planes.
	Worker may become pinned between rig and other truck components or worker could be pinned under truck rig if servicing of rig from under the truck is required.	• When any part of the rig or equipment is in motion, workers will stand a sufficient distance from the moving parts so that the worker is not pinned between the moving parts. • Workers will not manually "guide" any moving part of the rig when it is raised up. • Workers will not work under the rig or the truck. If work must be done under the truck or rig, the drill crew supervisor will contact the SHSS to ascertain a safe method for lockout of the equipment to ensure that adequate blocking is installed.
	High winds could destabilize rig. Mast could act as a conductor during a thunderstorm.	• Check weather conditions and forecasts to determine if conditions are acceptable for use of rig. • Do not operate the rig if winds exceed manufacturer's recommended tolerances.
	Pinch points.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate.
	Traffic in area of drilling.	• Wear reflective safety vests. • Barricade and mark drilling sites for visibility.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations- using rig-mounted wireline hammer	Worker can get hand caught between hammer and auger.	• Workers should never use their hands to guide the wireline hammer into the auger. • A long handled shovel or similar tool should be used for this task.
	Hammer unexpectedly falls.	• Inspect the cable line for frays before the hammer is used. • Always use the hand brake. • Put the hammer away when not in use. • Workers should remain alert at all times
	Heavy lifting	• Use Proper lifting techniques. • Objects greater than 60 lbs require assistance.
	Flying Debris	• Wear safety glasses
Drilling operations- start up drilling	Failure to have permits for borings could cause notice of violation.	• Obtain permit from relevant agency, if required, and have available on site before beginning to drill the borings.
	Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.	• Personnel will have been trained in the use of drilling equipment. • Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. • Immediately shut down the equipment. • Ensure that first aid kit is readily available to treat injured workers. • Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. • A spill control kit consisting of shovel, absorbent material and disposal drum must be available at the drilling location. • As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. • Loose protective clothing will be restrained with duct tape to prevent entanglement in moving parts.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations- start up drilling (Continued)	Air hoses or hydraulic hoses under pressure could suddenly release, whip and hit workers causing severe injury.	• Do not disconnect air hoses and compressors until hose line has been bled. • Visually inspect all connection of any lines under pressure. Use safety clamps to connect each side of connection to the other in the event the connection breaks. (The safety clamps will keep the hoses from whipping under the sudden release of pressure). • Tie back or attach hoses wherever possible to minimize the length of hose that could whip around in the event that there is a sudden release of pressure.
Drilling operations- drilling and well installation	Workers could place hands into moving parts of the rig or loose clothing could become entangled in moving machine parts either of which could injure a worker.	• Chains, sprockets and moving parts will be guarded. • Workers will not wear loose clothing, or any jewelry. Hooded sweatshirts will not have the hood exposed. • Workers will not place their hands or any part of their body between the drill auger or rod and the drill plate. Workers should never place themselves in a position where they can come in contact with the moving drill rods or augers. • The operator will verbally alert all workers and visually ensure that all workers are clear from dangerous parts of equipment before starting or engaging equipment. • Workers will avoid contact with any moving auger. Means will be provided to guard against employee contact with auger. (For example, use barricade around the perimeter of auger or electronic brake activated by a presence-sensing device.)

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations- drilling and well installation (Continued)	Atmospheric and contact hazards from chemical agents.	• Ambient air/visual monitoring will be used to verify selection of PPE. • Decontaminate drilling implements after use. • Avoid exposure to dust. Use dust control as necessary and possible. • PPE will be used. Drum and label all soil cuttings, and removed well components (pipe pieces, sand, screens) • Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled container. Discard other PPE as approved by the HSO and PESM.
	Sometimes workers use plastic sheeting in the area where they are drilling to protect the surrounding ground. This sheeting becomes very slippery when drilling muds are placed on it.	• Avoid using plastic sheeting, if possible. Many drillers today build a small bermed area where they place the drilling muds. It is easier to clean up the surface of the soil than to have workers slip on plastic sheeting. • If plastic sheeting must be used, dig out a small depression, place the plastic on the ground and cover the plastic with the removed soil. This way the plastic sheeting should not become too slippery as it will be covered by the removed soil. (This creates a larger volume of soil to be disposed but it is a safer method then working on slippery plastic.)
	The mast could be used to lift other objects as it is being raised causing potential failure of the mast.	• Masts shall be used in a manner specified by the manufacturer and should never be loaded beyond their capacity.
	Workers could injure themselves by cleaning the augers while they are rotating.	• Augers will be cleaned only when they are stopped and in neutral. They will not be restarted until the worker has given a verbal all clear to the operator and the operator has visually determined that the worker is clear of the auger. • Only long handled shovels will be used to move cutting from the auger.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations- drilling and well installation (Continued)	Workers could climb drill mast and expose themselves to a fall hazard.	• Climbing on the mast is not allowed.
	Strains from manually moving materials, equipment, and drums.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling augers or drill rods. • Avoid standing under any load. • Get help for lifting any item that weighs 50-pounds or more.
	Workers could trip or fall by the borehole.	• Cap and flag open boreholes. • All open boreholes will be protected as any open excavation if they are left unattended. (On this project all boreholes should be filled before the end of the day.)
	Pinch points- worker can become entangled in moving machinery.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate. • Keep constantly alert.
Drilling operations - Mixing grout or cement-bentonite mixture	Workers could be exposed to the dust from bags of material as they are poured into mixing container or when water is added to mixing container.	• Wear dust masks when pouring bags of concrete, cement or bentonite. • Avoid creating a lot of dust by slowly pouring the bags. • Avoid forcefully applying water into container so as to avoid generating dust.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Drilling operations - Mixing grout or cement-bentonite mixture (Continued)	Workers could be injured by the weight of the material bags or when handling the mixer.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling the mixer. • Never lift anything above shoulder height. • Get help for lifting any item that weighs 50-pounds or more.
Demolition of surface completions including bollards and concrete pads	Use of heavy equipment could cause injury to worker if struck by the equipment.	• Always maintain eye contact with operator of heavy equipment. • Wear reflective/brightly colored safety vest, • Avoid swing radius of equipment. • Use a spotter.
	Workers could be struck by debris when roll-offs are loaded.	• Do not stand near material as containers are being filled by mechanical equipment. • If manually placing material into containers, avoid contact with the debris already in the container.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Demolition of surface completions including bollards and concrete pads (Continued)	Pinch points- worker can become entangled in moving machinery.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate. • Keep constantly alert. • Restrain loose clothing with duct tape to prevent entanglement in moving parts. • Keep feet and hands clear of moving/suspended materials or equipment. • Keep machine guards in place. • Hard hats and orange colored vests will be required when working around moving equipment, cranes, and construction vehicles. • Do not stand beneath suspended equipment or in the path of moving vehicles.
Filling bore hole with bentonite chips and native material	Workers could fall into hole or trip on hole as mixture is poured.	• Do not come too close to edge. • Use care as heavy material is loaded into hole, watch your step and get assistance.
	Strains from manually moving materials.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling augers or drill rods. • Avoid standing under any load. • Get help for lifting any item that weighs 50-pounds or more.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Filling drums or roll-offs with debris and soils	Use of heavy equipment could cause injury to worker if struck by the equipment.	• Always maintain eye contact with operator of heavy equipment. • Wear reflective/brightly colored safety vest, • Avoid swing radius of equipment. • Use a spotter.
	Workers could be struck by the debris or come in contact with contaminated material as drums or roll-offs are loaded.	• Do not stand near material as containers are being filled by mechanical equipment. • If manually placing material into containers, avoid contact with the debris already in the container.
	Improper labeling of drums or roll-off could cause improper disposal or notice of violation from a regulatory agency.	• Always label container immediately after container is loaded or partially loaded before closing cover to container. • Label the container as required by the sampling and analysis plan.
Sampling of drums or roll-offs to determine disposal method.	When opening drums or roll-off boxes, workers could be exposed to contaminants.	• Wear PPE as required by the Health and Safety Plan. • Do not place head into any roll off box and contaminants may be particularly high inside the box.
	When opening drums, workers could be pinched by ring closure or could by hit by ring when it "snaps" back.	• Wear leather work gloves when handling drum rings. • When removing ring slowly remove it and keep pressure on it to keep it from snapping back.
	Workers could be exposed to contaminants in container or be injured by the debris in the container, while sampling.	• Wear PPE as required by the Health and Safety Plan. • Waste may shift as containers have been handled. Avoid direct contact with the debris. It may be helpful to wear leather work gloves over chemical protective gloves.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Management of water, sands, soils, well debris in storage.	Handling of drums and roll-offs can expose workers to injury.	• If handling drums, use a drum dolly, a pallet on a forklift, or a drum grabber attached to a backhoe or excavator to move the drums into storage. • If handling drums, inspect the path that the drum must be moved over. Ensure that there are no ruts or other obstacles that can cause the drum to tip over or be difficult to handle over the surface being traversed. • Place drums in an approved storage area. • When manually handling drums, avoid placing hands between drums, since you may pinch your fingers. Wear leather work gloves. • If drums have to be manually positioned, be sure you know how to "break and roll" a drum. Avoid manually positioning drums if at all possible. Only one person should break and roll a drum if it must be manually moved without mechanical assistance.
	Containers may leak exposing workers or the environment to the contaminants.	• Inspect all containers on a regular basis (weekly for non-hazardous material; daily for hazardous material). • Have spill cleanup supplies and equipment readily available. • Surface may become slippery. Wear work boots with good traction soles. • Avoid exposure to the material. Wear appropriate PPE. • Clean up all spills immediately. • Notify supervisor.

ACTIVITY HAZARD ANALYSIS #3

Activity: Drilling **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Loading of truck.	Drums could fall as they are being loaded causing injury to workers, damage to truck, drums or nearby objects. Damaged drums could leak and expose workers or the environment.	• Use a truck that has a Tommy Lift and move the drum onto the lift using a drum dolly. Be sure the drum is secure and will not roll when the lift is raised. Wheel the drum to the best location on the truck for transport. Be sure to evenly distribute the weight of the load on the bed of the truck. • Secure drums in place on the truck. • If drums are loaded with a drum handling device attached to a backhoe or excavator, stand away from the truck when the drum is placed on the truck. Once the drum is placed and the loader moves away from the truck, use a drum dolly on the truck to position the drum. • Avoid placing pallets of drums on a truck unless the pallets can be positioned where they are going to remain for transport. [It is very difficult to move loaded pallets manually.]
..Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Drilling rig, hand tools, power tools, drums, roll off boxes, heavy equipment for loading and lifting.	Daily or before use. Use inspection checklist. Complete form and sign. An operator's manual for the drill rig must be available at the job site.	• Only trained equipment operators may operate heavy equipment; only DMV-licensed personnel will operate trucks. • All drillers and drillers' helpers must have documented training on use of rig.

Notes:

CIH - Certified Industrial Hygienist
DMV - Department of Motor Vehicles
EHS - Environmental Health and Safety
EM - Engineer Manual
kV - kilovolt
MSDS - Material Safety Data Sheet
OCHCA - Orange County Health Care Agency
PESM - Project Environmental Safety Manager
PPE - Personal protective equipment

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Survey site	Slips, trips, and falls from various agents.	• Work areas will be visually inspected and pre-existing slip, trip, and fall hazards will be marked, barricaded, or eliminated as is feasible. • Work areas will be kept neat and in an orderly state of housekeeping. • Proper illumination will be maintained in work areas.
	Failure to properly survey site could cause exposures to electrical hazards and ground hazards.	• Conduct survey properly to identify all overhead electrical hazards, including electrical hazards in the path of the equipment as it being transported. • Ensure that ground has no hazards such as unstable soil, or underground utilities • Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.
Sampling by Direct Push- Inspection of Push Probe	Improper inspection of rig could cause workers to be exposed to hazards associated with operating and mechanical device.	• The push probe and all associate equipment will be inspected by a competent mechanic and be certified to be in safe operating condition. • Equipment will be inspected before use and the beginning of each shift. • Faulty or unsafe equipment will be tagged and removed from service. No faulty equipment or damaged items will be allowed in the work area. • Per EM-385-1-1; Section 16.M.06, assure that drilling equipment be equipped with two easily accessible emergency shutdown devices, one for the operator and one for the helper. • Inspect the brakes and tire pressure. • Inspect all hydraulic and pneumatic hoses.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Sampling by Direct Push - Set up work area and move vehicle into position	Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damaging of underground utilities, tip over of rig in unstable soil conditions.	• The push probe will not be moved into any work area until the site layout plan has been completed and the route of travel to any work site has been assessed for hazards (overhead lines, stability of roads and ground). • The site layout plan and the analysis of the route of travel will be covered at the pre-activity safety briefing along with this activity hazard analysis.
	Damage to existing utilities.	• Personnel will contact service facilities engineer before working near utilities. • Ensure that Underground Services Alert has been contacted. • Permits will be obtained through the OCHCA, prior to any activities. • Assure that weight of the vehicle the on ground is evenly distributed and is not so heavy as to damage any underground lines that may be near the surface.
	Pinch points.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate.
	Traffic in area of drilling.	• Wear reflective safety vests. • Barricade and mark drilling sites for visibility.
Sampling by Direct Push - start up continuous core sampling	Failure to have permits for borings could cause notice of violation.	• Obtain permit from relevant agency, if required, and have available on site before beginning work.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Sampling by Direct Push - continuous core sampling	Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.	• Personnel will have been trained in the use of the equipment. • Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. • Immediately shut down the equipment. • Ensure that first aid kit is readily available to treat injured workers. • Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. • A spill control kit consisting of shovel, absorbent material and disposal drum must be available at the drilling location. • As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. • Loose protective clothing will be restrained with duct tape to prevent entanglement in moving parts.
	Workers could place hands into moving parts of the rig or loose clothing could become entangled in moving machine parts either of which could injure a worker.	• Chains, sprockets and moving parts will be guarded. • Workers will not wear loose clothing, or any jewelry. Hooded sweatshirts will not have the hood exposed. • Workers will not place their hands or any part of their body between the drill auger or rod and the drill plate. Workers should never place themselves in a position where they can come in contact with the moving drill rods or augers. • The operator will verbally alert all workers and visually ensure that all workers are clear from dangerous parts of equipment before starting or engaging equipment.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Sampling by Direct Push - continuous core sampling (Continued)	Atmospheric and contact hazards from chemical agents.	• Ambient air/visual monitoring will be used to verify selection of PPE. • Decontaminate drilling implements after use. • Avoid exposure to dust. Use dust control as necessary and possible. • PPE will be used. Drum and label all soil cuttings, and removed well components (pipe pieces, sand, screens) • Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled container. Discard other PPE as approved by the HSO and PESM.
	Sometimes workers use plastic sheeting in the area where they are drilling to protect the surrounding ground. This sheeting becomes very slippery when drilling muds are placed on it.	• Avoid using plastic sheeting, if possible. Many drillers today build a small bermed area where they place the drilling muds. It is easier to clean up the surface of the soil than to have workers slip on plastic sheeting. • If plastic sheeting must be used, dig out a small depression, place the plastic on the ground and cover the plastic with the removed soil. This way the plastic sheeting should not become too slippery as it will be covered by the removed soil. (This creates a larger volume of soil to be disposed but it is a safer method then working on slippery plastic.)
	Strains from manually moving materials, equipment, and drums.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling drill rods. • Avoid standing under any load. • Get help for lifting any item that weighs 50-pounds or more.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Sampling by Direct Push - continuous core sampling (Continued)	Pinch points- worker can become entangled in moving machinery.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate. • Keep constantly alert.
Sampling by Direct Push - Mixing grout or cement-bentonite mixture	Workers could be exposed to the dust from bags of material as they are poured into mixing container or when water is added to mixing container.	• Wear dust masks when pouring bags of concrete, cement or bentonite. • Avoid creating a lot of dust by slowly pouring the bags. • Avoid forcefully applying water into container so as to avoid generating dust.
	Workers could be injured by the weight of the material bags or when handling the mixer.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling the mixer. • Never lift anything above shoulder height. • Get help for lifting any item that weighs 50-pounds or more.
Sampling by Direct Push - Filling bore hole with grout or cement-bentonite mixture	Workers could fall into hole or trip on hole as mixture is poured.	• Do not come too close to edge. • Use care as heavy material is loaded into hole, watch your step and get assistance.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Sampling by Direct Push - Filling bore hole with grout or cement-bentonite mixture (Continued)	Strains from manually moving materials.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Use care when handling augers or drill rods. • Avoid standing under any load. • Get help for lifting any item that weighs 50-pounds or more.
Filling drums or roll-offs with debris and soils	Workers could be struck by the debris or come in contact with contaminated material as drums or roll-offs are loaded.	• Do not stand near material as containers are being filled. • If manually placing material into containers, avoid contact with the debris already in the container.
	Improper labeling of drums or roll-off could cause improper disposal or notice of violation from a regulatory agency.	• Always label container immediately after container is loaded or partially loaded before closing cover to container. • Label the container as required by the sampling and analysis plan.
Sampling of drums or roll-offs to determine disposal method.	When opening drums or roll-off boxes, workers could be exposed to contaminants.	• Wear PPE as required by the Health and Safety Plan. • Do not place head into any roll off box and contaminants may be particularly high inside the box.
	When opening drums, workers could be pinched by ring closure or could by hit by ring when it "snaps" back.	• Wear leather work gloves when handling drum rings. • When removing ring slowly remove it and keep pressure on it to keep it from snapping back.
	Workers could be exposed to contaminants in container or be injured by the debris in the container, while sampling.	• Wear PPE as required by the Health and Safety Plan. • Waste may shift as containers have been handled. Avoid direct contact with the debris. It may be helpful to wear leather work gloves over chemical protective gloves.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Management of water, sands, soils, well debris in storage.	Handling of drums and roll-offs can expose workers to injury.	• If handling drums, use a drum dolly, a pallet on a forklift, or a drum grabber attached to a backhoe or excavator to move the drums into storage. • If handling drums, inspect the path that the drum must be moved over. Ensure that there are no ruts or other obstacles that can cause the drum to tip over or be difficult to handle over the surface being traversed. • Place drums in an approved storage area. • When manually handling drums, avoid placing hands between drums, since you may pinch your fingers. Wear leather work gloves. • If drums have to be manually positioned, be sure you know how to "break and roll" a drum. Avoid manually positioning drums if at all possible. Only one person should break and roll a drum if it must be manually moved without mechanical assistance.
	Containers may leak exposing workers or the environment to the contaminants.	• Inspect all containers on a regular basis (weekly for non-hazardous material; daily for hazardous material). • Have spill cleanup supplies and equipment readily available. • Surface may become slippery. Wear work boots with good traction soles. • Avoid exposure to the material. Wear appropriate PPE. • Clean up all spills immediately. • Notify supervisor.

ACTIVITY HAZARD ANALYSIS #4

Activity: Sampling by Direct Push **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Loading of truck.	Drums could fall as they are being loaded causing injury to workers, damage to truck, drums or nearby objects. Damaged drums could leak and expose workers or the environment.	• Use a truck that has a Tommy Lift and move the drum onto the lift using a drum dolly. Be sure the drum is secure and will not roll when the lift is raised. Wheel the drum to the best location on the truck for transport. Be sure to evenly distribute the weight of the load on the bed of the truck. • Secure drums in place on the truck. • If drums are loaded with a drum handling device attached to a backhoe or excavator, stand away from the truck when the drum is placed on the truck. Once the drum is placed and the loader moves away from the truck, use a drum dolly on the truck to position the drum. • Avoid placing pallets of drums on a truck unless the pallets can be positioned where they are going to remain for transport. [It is very difficult to move loaded pallets manually.]
..Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Push Probe, hand tools, power tools, drums, roll off boxes, heavy equipment for loading and lifting.	Daily or before use. Use inspection checklist. Complete form and sign.	• Only trained equipment operators may operate heavy equipment; only DMV-licensed personnel will operate trucks. • All Push Probe operators and helpers must have documented training on use of the equipment.

Notes:

CIH - Certified Industrial Hygienist
DMV - Department of Motor Vehicles
EHS - Environmental Health and Safety
EM - Engineer Manual
kV - kilovolt
MSDS - Material Safety Data Sheet
OCHCA - Orange County Health Care Agency
PESM - Project Environmental Safety Manager
PPE - Personal protective equipment

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Survey site	Slips, trips, and falls from various agents.	• Work areas will be visually inspected and pre-existing slip, trip, and fall hazards will be marked, barricaded, or eliminated as is feasible. • Work areas will be kept neat and in an orderly state of housekeeping. • Proper illumination will be maintained in work areas.
	Failure to properly survey site could cause exposures to electrical hazards and ground hazards.	• Conduct survey properly to identify all overhead electrical hazards, including electrical hazards in the path of the equipment as it being transported. • Ensure that ground has no hazards such as unstable soil, or underground utilities • Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.
Concrete Coring/Sawcutting	Traffic in area of Coring/Sawcutting.	• Wear reflective safety vests. • Barricade and mark drilling sites for visibility. Use a flag person, if necessary, to direct traffic away from drilling areas.
	Strains from manually moving equipment.	• Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. • Mechanical equipment will be used as much as possible. • Avoid standing under any load. • Get help for lifting any item that weighs 50-pounds or more.
	Workers could get cut with concrete cutting blade.	• Only trained personnel will be allowed to operate the machinery. • Operators will be required to wear steel toed shoes. • Nobody will be allowed in front of the concrete cutter while in operation. • The safety shield around the blade must always be down while in operation.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Concrete Coring/Sawcutting (Continued)	Pinch points- worker can become entangled in moving machinery.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate. • Keep constantly alert.
	Flying Debris from removing concrete with a jack-hammer.	• Wear safety glasses
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously.
Hand Auguring	Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damaging of underground utilities.	• A site layout plan will become part of this hazard analysis as soon as it is completed. • Hand auguring will not begin until the site layout plan has been completed and the work site has been assessed for hazards (underground lines). • The site layout plan will be covered at the pre-activity safety briefing along with this activity hazard analysis.
	Damage to existing utilities.	• Personnel will contact service facilities engineer before working near utilities. • Ensure that Underground Services Alert has been contacted.
	Atmospheric and contact hazards from chemical agents.	• Ambient air/visual monitoring will be used to verify selection of PPE. • Decontaminate hand auger after use. • Avoid exposure to dust. Use dust control as necessary and possible. • PPE will be used. • Drum and label all soil cuttings. • Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled container. Discard other PPE as approved by the HSO.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Hand Auguring (Continued)	Heat Stress	• Follow the heat stress procedures referenced in the SHSP.
	Workers could trip or fall by the borehole.	• Cap and flag open boreholes. • All open boreholes will be protected as any open excavation if they are left unattended. (On this project all boreholes should be filled before the end of the day.)
Excavation	Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damaging of underground utilities.	• A site layout plan will become part of this hazard analysis as soon as it is completed. • Hand auguring will not begin until the site layout plan has been completed and the work site has been assessed for hazards (underground lines). • The site layout plan will be covered at the pre-activity safety briefing along with this activity hazard analysis.
	Damage to existing utilities.	• Personnel will contact service facilities engineer before working near utilities. • Ensure that Underground Services Alert has been contacted. • Assure that weight of the backhoe on ground is evenly distributed and is not so heavy as to damage any underground lines that may be near the surface.
	Use of heavy equipment could cause injury to worker if struck by the equipment.	• Always maintain eye contact with operator of heavy equipment. • Wear reflective/brightly colored safety vest, • Avoid swing radius of equipment. • Use a spotter.
	Pinch points.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Excavation (Continued)	Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.	• Personnel will have been trained in the use of drilling equipment. • Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. • Immediately shut down the equipment. • Ensure that first aid kit is readily available to treat injured workers. • Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. • A spill control kit consisting of shovel, absorbent material and disposal drum must be available at the drilling location. • As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. • Loose protective clothing will be restrained with duct tape to prevent entanglement in moving parts.
	Atmospheric and contact hazards from chemical agents.	• Ambient air/visual monitoring will be used to verify selection of PPE. • Decontaminate hand auger after use. • Avoid exposure to dust. Use dust control as necessary and possible. • PPE will be used. • Drum and label all soil cuttings. • Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled container. Discard other PPE as approved by the HSO and PESM.
	Traffic in area of excavation.	• Wear reflective safety vests. • Barricade and mark excavation sites for visibility. Use a flag person, if necessary, to direct traffic away from excavation areas.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Excavation (Continued)	Workers could be struck by debris when roll-offs are loaded.	• Do not stand near material as containers are being filled by mechanical equipment. • If manually placing material into containers, avoid contact with the debris already in the container.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously.
Compacting the backfill	Pinch points- worker can become entangled in moving machinery.	• Avoid placing hands in places close to moving machinery. • Wear gloves, as appropriate. • Keep constantly alert. • Restrain loose clothing with duct tape to prevent entanglement in moving parts. • Keep feet and hands clear of moving/suspended materials or equipment. • Keep machine guards in place. • Hard hats and orange colored vests will be required when working around moving equipment, cranes, and construction vehicles. • Do not stand beneath suspended equipment or in the path of moving vehicles.
	Use of heavy equipment could cause injury to worker if struck by the equipment.	• Always maintain eye contact with operator of heavy equipment. • Wear reflective/brightly colored safety vest, • Avoid swing radius of equipment. • Use a spotter.
	Traffic in area of excavation.	• Wear reflective safety vests. • Barricade and mark excavation sites for visibility. Use a flag person, if necessary, to direct traffic away from excavation areas.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Compacting the backfill (Continued)	Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.	• Personnel will have been trained in the use of drilling equipment. • Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. • Immediately shut down the equipment. • Ensure that first aid kit is readily available to treat injured workers. • Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. • A spill control kit consisting of shovel, absorbent material and disposal drum must be available at the drilling location. • As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. • Loose protective clothing will be restrained with duct tape to prevent entanglement in moving parts.
	Workers could be struck by debris when roll-offs are loaded.	• Do not stand near material as containers are being filled by mechanical equipment. • If manually placing material into containers, avoid contact with the debris already in the container.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously.
Management and sampling of water, sands and soils.	Workers could be struck by debris when roll-offs are loaded.	• Do not stand near material as containers are being filled by mechanical equipment. • If manually placing material into containers, avoid contact with the debris already in the container.
	When opening drums or roll-off boxes, workers could be exposed to contaminants.	• Wear PPE as required by the Health and Safety Plan. • Do not place head into any roll off box and contaminants may be particularly high inside the box.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Management and sampling of water, sands and soils. (Continued)	When opening drums, workers could be pinched by ring closure or could by hit by ring when it "snaps" back.	• Wear leather work gloves when handling drum rings. • When removing ring slowly remove it and keep pressure on it to keep it from snapping back.
	Handling of drums and roll-offs can expose workers to injury.	• If handling drums, use a drum dolly, a pallet on a forklift, or a drum grabber attached to a backhoe or excavator to move the drums into storage. • If handling drums, inspect the path that the drum must be moved over. Ensure that there are no ruts or other obstacles that can cause the drum to tip over or be difficult to handle over the surface being traversed. • Place drums in an approved storage area. • When manually handling drums, avoid placing hands between drums, since you may pinch your fingers. Wear leather work gloves. • If drums have to be manually positioned, be sure you know how to "break and roll" a drum. Avoid manually positioning drums if at all possible. Only one person should break and roll a drum if it must be manually moved without mechanical assistance.
	Containers may leak exposing workers or the environment to the contaminants.	• Inspect all containers containing liquids on a regular basis (weekly for non-hazardous material; daily for hazardous material). • Have spill cleanup supplies and equipment readily available. • Surface may become slippery. Wear work boots with good traction soles. • Avoid exposure to the material. Wear appropriate PPE. • Clean up all spills immediately. • Notify supervisor.

ACTIVITY HAZARD ANALYSIS #5

Activity: Hand Auguring – Excavation **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Loading of truck.	Drums could fall as they are being loaded causing injury to workers, damage to truck, drums or nearby objects. Damaged drums could leak and expose workers or the environment.	• Use a truck that has a Tommy Lift and move the drum onto the lift using a drum dolly. Be sure the drum is secure and will not roll when the lift is raised. Wheel the drum to the best location on the truck for transport. Be sure to evenly distribute the weight of the load on the bed of the truck. • Secure drums in place on the truck. • If drums are loaded with a drum handling device attached to a backhoe or excavator, stand away from the truck when the drum is placed on the truck. Once the drum is placed and the loader moves away from the truck, use a drum dolly on the truck to position the drum. • Avoid placing pallets of drums on a truck unless the pallets can be positioned where they are going to remain for transport. [It is very difficult to move loaded pallets manually.]
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Hand tools, power tools, drums, roll off boxes, heavy equipment for excavation and backfilling.	Daily or before use. Use inspection checklist. Complete form and sign.	• Only trained equipment operators may operate heavy equipment; only DMV-licensed personnel will operate trucks.

Notes:

CIH - Certified Industrial Hygienist
DMV - Department of Motor Vehicles
EHS - Environmental Health and Safety
EM - Engineer Manual
kV - kilovolt
MSDS - Material Safety Data Sheet
NASA - National Aeronautics and Space Administration
PESM - Project Environmental Safety Manager
PPE - Personal protective equipment

ACTIVITY HAZARD ANALYSIS #6

Activity: Collection of Groundwater Samples/ Purging Wells **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Collecting groundwater samples	Back strains.	• Pre-employment back evaluations are recommended for craft workers who may be at greater risk of developing low back pain or low back injury. • Surveys shall be performed by qualified persons to identify and evaluate tasks that might result in injuries due to ergonomic hazards. The focus of the surveys will be operations that involve the manual lifting and moving of objects of excessive weight or asymmetric size. • Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, and pressing with hand and fingers. • Do not lift more than 50 pounds. • Avoid prolonged repetitive motion. Rotate job tasks with other workers. • Get help or use mechanical lifting devices for heavy loads. • When lifting box covers, get help if cover is too heavy or it is too difficult to handle because cover is wedged or impaired.
	Struck by well cover when inside box to collect sample.	• Assure that cover cannot fall when worker's appendage is in the well vault by using a block or tie the cover to a stationary object to prevent cover from falling on worker.
	Exposure to chemical contaminants.	• Wear required PPE and respiratory protection as specified in the SSHP. • Remove PPE properly and wash hands.
	Slips, trips, and falls.	• Maintain good housekeeping. • Mark or remove all identified trip and slip hazards. • Maintain proper illumination in work areas.

ACTIVITY HAZARD ANALYSIS #6

Activity: Collection of Groundwater Samples/ Purging Wells **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Collecting groundwater samples (Continued)	Worker can get hand caught between cover and the box when lifting or replacing covers.	• Use care when lifting covers. • Wear leather gloves when handling covers.
	Strains from use of tools such as extension poles, hand pumps, pry bars.	• Inspect all tools for damage before use. • Do not use damaged tools and tag them "out of service". • Maintain steady pace and follow the rest periods given on the job. • Use appropriate tools for the task and maintain in good condition.
	Vehicular traffic in areas of sampling exposes workers to traffic hazards.	• If a flag person is used to direct traffic away from workers, assure that the person is trained according to the MUTCD. • Where wells are open, workers will place barricades or traffic cones to direct drivers away from work area. • All workers working in all areas will wear high-visibility safety vests.
	Wells covers and openings to ground and vault areas may have insects such as black widows, brown recluse spiders and scorpions.	• Wear leather gloves when opening well covers. • Inspect opening or vault for the insects. If insects are present, avoid them or remove them while wearing gloves. • Have first aid kit available to treat insect stings. (If allergic to any insect bites, notify the SSHO. If possible, a person, not allergic to insect bites should be the person opening covers.)

ACTIVITY HAZARD ANALYSIS #6

Activity: Collection of Groundwater Samples/ Purging Wells **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Collecting groundwater samples (Continued)	Well vaults, although not more than 4-feet deep, could have atmospheric hazards if well has off-gassed and the vault space has not cleared, thus exposing worker to vapors.	• Consider space as a non-permit required confined space. (No permit required but the following procedure must be followed.) • Before lifting cover to vault, if it is possible to place a probe through a small opening in or around the cover, measure the air inside using a PID or FID. If the reading is less than 10 ppm, open the well cover and proceed with work activities. If reading is greater than 10ppm open well cover slowly, secure cover and stand back. • If it is not possible to monitor the air inside the vault prior to opening the cover, carefully open the cover, secure the cover, **do not enter the vault**, monitor the air inside the vault, if it less than 10 ppm using a PID or FID, enter the vault. • If air monitoring shows levels above 10 ppm, do not enter the vault, stand back from the vault, allow the opened vault to ventilate with the outside air, measure the air inside again after 5 minutes, if readings are still above 10 ppm contact the SSHO.
Sample handling	Atmospheric and contact hazards from contaminated soil or water.	• Wear required PPE and respiratory protection. • Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. • Decontaminate exteriors of sample containers. Avoid spills. Insure spill cleanup supplies are available. *Note: The intent of PPE is to prevent contact with groundwater that may have low levels of contaminants. (Although these contaminants are low in concentration, they still can be absorbed by the skin or cause irritation to the skin.)*

ACTIVITY HAZARD ANALYSIS #6

Activity: Collection of Groundwater Samples/ Purging Wells **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Gauge handling	Contaminated or potentially contaminated gauge line comes in contact with technician exposing technician to contaminants.	• Wear specified PPE; especially hand protection, chemical protective gloves as specified in the PPE matrix. • Decontaminate the gauge line by rinsing with clean water.
	Contaminated or potentially contaminated gauge line comes in contact with the environment (ground, other equipment, or another well.)	• Decontaminate gauge line before placing the line on the ground or on top of other equipment or surfaces. • Decontaminate gauge line before proceeding to next well.
Management of purge water.	Handling of drums and roll-offs can expose workers to injury.	• If handling drums, use a drum dolly, a pallet on a forklift, or a drum grabber attached to a backhoe or excavator to move the drums into storage. • If handling drums, inspect the path that the drum must be moved over. Ensure that there are no ruts or other obstacles that can cause the drum to tip over or be difficult to handle over the surface being traversed. • Place drums in an approved storage area. • When manually handling drums, avoid placing hands between drums, since you may pinch your fingers. Wear leather work gloves. • If drums have to be manually positioned, be sure you know how to "break and roll" a drum. Avoid manually positioning drums if at all possible. Only one person should break and roll a drum if it must be manually moved without mechanical assistance.

ACTIVITY HAZARD ANALYSIS #6

Activity: Collection of Groundwater Samples/ Purging Wells **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Principal Steps	Potential Hazards	Recommended Controls
Management of purge water. (Continued)	Containers may leak exposing workers or the environment to the contaminants.	• Inspect all containers on a regular basis (weekly for non-hazardous material; daily for hazardous material). • Have spill cleanup supplies and equipment readily available. • Surface may become slippery. Wear work boots with good traction soles. • Avoid exposure to the material. Wear appropriate PPE. • Clean up all spills immediately. • Notify supervisor.
Loading of truck.	Drums could fall as they are being loaded causing injury to workers, damage to truck, drums or nearby objects. Damaged drums could leak and expose workers or the environment.	• Use a truck that has a Tommy Lift and move the drum onto the lift using a drum dolly. Be sure the drum is secure and will not roll when the lift is raised. Wheel the drum to the best location on the truck for transport. Be sure to evenly distribute the weight of the load on the bed of the truck. • Secure drums in place on the truck. • If drums are loaded with a drum handling device attached to a backhoe or excavator, stand away from the truck when the drum is placed on the truck. Once the drum is placed and the loader moves away from the truck, use a drum dolly on the truck to position the drum. • Avoid placing pallets of drums on a truck unless the pallets can be positioned where they are going to remain for transport. [It is very difficult to move loaded pallets manually.]

ACTIVITY HAZARD ANALYSIS #6

Activity: Collection of Groundwater Samples/ Purging Wells **Analyzed By/Date:** Sean Moncrief 4/29/04 **Reviewed By:** Maureen Sassoon, CIH

Equipment to be Used	Inspection Requirements	Training Requirements
Flagging equipment- flags, signs	None.	• Flagger training- MUTCD.
Gauges and Meters	Daily and before use.	• Employees will be trained on the gauges and meters proper use. Follow manufacturers' requirements for inspection and use.

Notes:

AHA - Activity Hazard Analysis
CIH - Certified Industrial Hygienist
FID - Flame Ionization Detector
MUTCD - Manual on Uniform Traffic Control Devices
PID - Photoionization Detector
PPE - personal protective equipment.
ppm - parts per million
SSHO - Site Safety and Health Officer
SSHP - Site Safety and Health Plan

ATTACHMENT 2

SAFETY FORMS

SAFETY COMPLIANCE AGREEMENT FORM

Site: **CLOSURE OF INACTIVE TEMPORARY ACCUMULATION AREAS AND OTHER SITES AT THE FORMER MARINE CORPS AIR STATION**
RMA Project No.: 04-224

I the undersigned, acknowledge that I have attended the safety meeting, and I have read and understood this safety plan, and do agree to assertively adhere to the specifications within. I understand that I may be prohibited from continuing work on the project for failing to comply with this safety plan.

SIGNATURE & NAME (PRINTED)	COMPANY	DATE
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
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_____	_____	_____
( )		
_____	_____	_____
( )		

Meeting Conducted by: _____

SAFETY COMPLETION REPORT

A completed copy of this report is to be placed into the project files within seven days of the completion of site work.

Site Name: _____ Project: _____
Project Manager: _____ SSO: _____

Safety Plan:
Was the plan complete? _____
Was the plan appropriate to conditions found onsite? _____
Was more information on the site available but not included? _____
Was the plan clear and understandable? _____

Plan implementation:
What levels of protection were used? A____ B____ C____ D____

Field Air Monitoring Results:

High	Low	Typical
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Air Monitoring Results: _____
_____

Any Equipment Problems? (Include ID #) _____
_____

Level of General Site Control (Good, Moderate, Poor): _____
Evaluate General RMA and Subcontractor Compliance/Performance:
_____
_____
_____

Comments: _____
_____
_____
_____

TAILGATE SAFETY MEETING

RMA

Project No: _____ Project Name / Location: _____
Subcontract No _____
Date: _____ Time: _____

Client: US Navy SWDIV Client Phone: _____

Type of Work: _____

Chemicals Used: _____

SAFETY TOPICS PRESENTED

Protective Clothing / Equipment: _____

Chemical Hazards: _____

Physical Hazards: _____

Emergency Procedures: _____

*Hospital: _____ *Phone: _____

Hospital Address: _____

Special Equipment: _____

Other: _____

ATTENDEES

Name (print):	Signature:

Meeting Conducted by:

_____ _____
Name (print) Signature

ACCIDENT REPORT
NAVFAC 5100/20 (Rev 4-79) (Type or Print) REPORT NAVFAC 5100-3A

NAME OF ACTIVITY/OICC/OIC/ROICC OFFICE	ACTIVITY REPORT NUMBER (No sequentially by CY)
NAME OF CONTRACTOR (Complete only if Contractor Accident)	CONTRACT NUMBER

TYPE OF ACCIDENT (Check "X")
☐ FIRST AID INJURY/ILLNESS ☐ LOST TIME INJURY/ILLNESS ☐ FATALITY
☐ LIMITED DUTY INJURY/ILLNESS ☐ PROPERTY DAMAGE

INSTRUCTIONS

Place an (X) in the box(es) within each block that best suits the descriptive information given.

For ILLNESS, Complete Items 1A, 2 Thru 8: For INJURY, Complete Items 1B, 2 Thru 8: For PROPERTY DAMAGE, Complete Items 5 Thru 9:

1A. KIND OF ILLNESS
- ☐ DISORDERS (REPEATED TRAUMA)
- ☐ DUST DISEASE OF LUNG
- ☐ INGESTION (POISONING)
- ☐ INHALATION (POISONING)
- ☐ SKIN DISEASE/DISORDERS
- ☐ OTHER

1B. KIND OF INJURY
- ☐ AMPUTATION
- ☐ ABRASION
- ☐ BITE (ANIMAL/INSECT)
- ☐ BURN (CHEMICAL/THERMAL)
- ☐ CONTUSION
- ☐ DISLOCATION
- ☐ ELECTRIC SHOCK
- ☐ FOREIGN BODY EMBEDDED
- ☐ FRACTURE
- ☐ HEARING LOSS
- ☐ INTERNAL
- ☐ LACERATION
- ☐ MULTIPLE
- ☐ SPRAIN/STRAIN
- ☐ OTHER

2. BODY PARTS AFFECTED
- ☐ ARMS ☐ HANDS ☐ FINGERS
- ☐ LEGS ☐ FEET ☐ TOES
- ☐ HEAD ☐ FACE ☐ EYES
- ☐ TRUNK ☐ BACK ☐ OTHER
- ☐ RESPIRATORY TRACT

3. SOURCE OF INJURY/ILLNESS
- ☐ ANIMAL/INSECTS
- ☐ BUILDING MATERIAL
- ☐ BUILDINGS/STRUCTURES
- ☐ CHEMICALS
- ☐ DUSTS
- ☐ ELECTRIC APPARATUS
- ☐ FLAME/HOT SUBSTANCE
- ☐ HAND TOOLS
- ☐ HOISTING APPARATUS
- ☐ LADDERS
- ☐ MACHINE/MOTOR/PUMP
- ☐ PLATFORMS/SCAFFOLDS
- ☐ VEHICLES/EQUIPMENT
- ☐ OTHER

4. TYPE OF ACCIDENT
- ☐ BODY REACTION
- ☐ BITE OR STING
- ☐ CAUGHT BETWEEN
- ☐ CAUGHT IN
- ☐ CAUGHT UNDER
- ☐ CONTACT WITH
- ☐ FALL FROM HEIGHT
- ☐ OVEREXERTION
- ☐ PUNCTURE
- ☐ RUBBING/ABRASION
- ☐ STRUCK AGAINST
- ☐ STRUCK BY
- ☐ TRIPPING ☐ OTHER

5. UNSAFE CONDITION
- ☐ DEFECTIVE EQUIPMENT
- ☐ EXCESSIVE NOISE
- ☐ HAZARDOUS NOISE ☐ OTHER
- ☐ IMPROPER GUARDING
- ☐ IMPROPER ILLUMINATION
- ☐ NO UNSAFE CONDITION

6. UNSAFE PERSONAL FACTOR
- ☐ BODILY DEFECTS ☐ OTHER
- ☐ FATIGUE/ILLNESS
- ☐ IMPROPER ATTITUDE
- ☐ LACK OF KNOWLEDGE/SKILL
- ☐ NO UNSAFE PERSONAL FACTOR

7. UNSAFE ACT
- ☐ FAIL TO SECURE OR WARN
- ☐ FAIL TO USE PROTECTIVE EQUIPMENT
- ☐ FAIL TO WEAR PROPER ATTIRE
- ☐ IMPROPER USE OF BODY
- ☐ IMPROPER USE OF EQUIPMENT
- ☐ INATTENTION
- ☐ OPERATING W/O AUTHORITY
- ☐ UNSAFE ACT BY THIRD PARTY
- ☐ UNSAFE LOADING/PLACING
- ☐ UNSAFE POSITION/POSTURE
- ☐ USING UNSAFE EQUIPMENT
- ☐ WORKING AT UNSAFE SPEED
- ☐ WORKING ON MOVING EQUIPMENT
- ☐ OTHER
- ☐ NO UNSAFE ACT

8. TYPE OF WORK/OPERATION
- ☐ ASPHALT
- ☐ AUTO VEHICLE MAINT/REPAIR
- ☐ CARPENTRY
- ☐ CONCRETE
- ☐ CONST EQUIP MAINT/REPAIR
- ☐ CONST EQUIP OPERATION
- ☐ CRANE OPERATION
- ☐ CUSTODIAL SERVICE
- ☐ DEMOLITION
- ☐ EQUIP MAINT (EXCEPT AUTO/CONST)
- ☐ ELECTRICAL
- ☐ EXCAVATION AND EARTHWORK
- ☐ FORMING
- ☐ FRAMING
- ☐ GROUNDS MAINT
- ☐ MACHINE SHOP
- ☐ MASONRY
- ☐ OFFICE WORK
- ☐ PAINTING
- ☐ PLUMBING
- ☐ ROOFING
- ☐ SEWAGE/WASTE DISPOSAL
- ☐ SHEETMETAL
- ☐ STEEL ERECTION
- ☐ WAREHOUSING/STORAGE
- ☐ WELDING
- ☐ OTHER

9. PROPERTY DAMAGE

OWNERSHIP _____ ESTIMATE OF LOSS $ _____

DRILLING EQUIPMENT	
Contract Name and Number:	Contractor/Subcontractor:
CQC:	Location:
Competent Mechanic:	Date:
Equipment name and number:	

	Yes	No	N/A
1. Is a copy of the manual for all drilling equipment available? (16.M.02)			
2. Has a survey been conducted to identify overhead electrical hazards and potential ground hazards and their locations identified in the site layout plan? (16.M.03)			
3. Does the hazard analysis contain copies of Material Safety Data Sheets for all drilling fluids available? (16.M.03a)			
4. Have all members of the drilling crew been trained the operation, inspection, and maintenance of the equipment; the safety features and procedures to be used; and overhead electrical lines and underground hazards? (16.M.04a)			
5 Does the drilling equipment have two easily accessible emergency shut down devices (one for the operator and one for the helper)? (16.M.05)			
6. Is the equipment posted with a warning of electrical hazards? (16.M.06a)			
7. Is there a spotter or an electrical proximity warning device available to ensure safe distances from power lines are maintained? (16.M.06b)			
8. Before moving earth drilling equipment, has the travel route been surveyed for overhead and terrain hazards, particularly overhead electrical hazards? (16.M.07a)			
9. Is equipment set-up in a stable manner, with cribbing if necessary? (16.M.08a)			
10. Are outriggers being used in accordance with the manufacturer's recommendations? (16.M.08b)			
11. Are drill crew members prohibited from wearing loose clothing, jewelry, or equipment which might become caught in moving machinery? (16.M.09b)			
12. Are steps being taken to control dust? (16.M.09i)			
13. Are augers cleaned only when the rotating mechanism is in neutral and the auger is stopped? (16.M.09j)			
14 Means shall be provided to guard against employee contact with auger. (guard around the auger; barricade around the perimeter of the auger; electronic brake activated by a presence-sensing device). 16.M .10l			

Comments:

Excavation Checklist

Project: _____ Weather: _____ Date: _____

Measurements of Trench: Depth: _____ Length: _____ Width: _____

Soil Type: ___ See attached "Soils Analysis Checklist"

Type of Protective System Used: _____

Yes	No	N/A	Remarks
			Trenches and Excavations 5 feet or over sloped, benched, shored or shielded.
			Excavations, adjacent areas, and Protective Systems inspected by the Competent Person daily, prior to the start of work.
			Competent Person has the authority to remove workers from the excavation immediately.
			Surface encumbrances supported or removed.
			Employees protected from loose rock or soil that could possibly pose a hazard by falling or rolling into the excavation.
			Hard hats worn by all employees.
			Spoils, materials, and equipment set back a minimum of 2' from the edge of the excavation.
			Ladders provided on trenches 4 feet or more in depth.
			Barriers provided at all remote excavations, well, pits, shafts, etc. Walkways and bridges, over excavations 4' or more in depth, must be equipped with guardrails
			Warning vests, or other highly visible garments, provided and worn by all employees exposed to public vehicular traffic.
			Employees required to stand away from vehicles being loaded or unloaded.
			Employees prohibited from working or walking under suspended loads.
			Employees prohibited from working on the faces of sloped or benched excavations above other employees.
			Employees prohibited to work in trenches that has water unless water is being properly controlled and approved by a registered engineer.
			Warning system established and utilized when mobile equipment is operating near the edge of an excavation.

Utilities

Yes	No	N/A	Remarks
			Utility companies contacted and/or utilities located.
			Underground installations protected, supported, or removed when the excavation is open.

Means of Access or Egress

Yes	No	N/A	Remarks
			Lateral travel distance to a means of egress does not exceed 25', for excavations 4' or more in depth.
			Ladders, when used, must extend 3' above the edge of the trench and be secured.
			Structural ramps used by employees must be designed by a Competent Person.
			Structural ramps used for equipment must be designed by a licensed Professional Engineer (PE).
			Ramps must be constructed of materials of uniform thickness, securely cleated together on the bottom, and have a non-slip surface.
			Employees protected from cave-ins while entering, working in, or exiting excavation.

Wet Conditions

Yes	No	N/A	Remarks
			Precautions taken to protect employees from accumulation of water.
			Water removal equipment monitored by a Competent Person.
			Surface water controlled or diverted.
			Inspection made after each rainstorm.

Hazardous Atmospheres

Yes	No	N/A	Remarks
			Atmosphere tested when there is a reasonable possibility of oxygen deficiency, or build up of other hazardous gases, that may expose an employee to a hazard.
			Oxygen content is between 19.5% and 23.5%.

			Ventilation provided to prevent flammable gas from building up to 10% of the lower explosive limit of the gas.
			Testing conducted to ensure that atmosphere remains safe.
			Emergency Response Equipment readily available where a hazardous atmosphere could or does exist.
			Employees trained on the use of Personal Protective and Emergency Response Equipment.
			Safety harness and life line must be individually attended when an employee entering a deep confined excavation or bell bottom pier.

Protective Support Systems

Yes	No	N/A	Remarks
			Materials and/or equipment selected on soil analysis, expected loads, and trench parameters.
			Materials and equipment inspected and in good condition.
			Materials and equipment not in good condition must be removed from service and not returned until repaired, inspected, and approved by a Registered Professional engineer.
			Protective systems installed without exposing employees to hazards of cave-ins, collapses, or from being struck by materials of equipment. Install from the top, down, and from the bottom up.
			Members of Protective Support System must be securely fastened.
			Adjacent structures must be securely supported.
			The backfill process must progress with the removal of the support system.
			Employee prohibited from remaining in a Trench Box when being moved vertically.

Soil Analysis
Visual Test

Particle Type: Fine Grained (cohesive) ___ Coarse Grained (sand or gravel) ___
Water Conditions: Wet ___ Dry ___ Submerged ___ Surface Water Present ___

Yes	No	N/A	Remarks
			Previously Disturbed Soils?

			Underground Utilities Protected?
			Layered Soils?
			Layered Soil Dipping Into Excavation?
			Excavation Exposed to Vibration?
			Surface Encumbrances Present? If yes what type?
			Evidence of Cracking or Spalling Observed?
			Potentially Hazardous Atmosphere Exist? If yes identify condition or source
			Confined Space Procedures initiated? If no why not?

Manual Test

Plasticity: Cohesive ___ Non-cohesive ___

Dry Strength: Granular (crumbles easily) ___ Cohesive (broken w/difficulty) ___

Note: The following unconfined compressive strength tests should be performed on undisturbed soils.

Thumb Test: Used to estimate unconfined compressive strength of a cohesive soil

Test Performed Yes___ No___

___Type "A" Soil: indented by thumb with very great difficulty.

___Type "B" Soil: indented by thumb with some difficulty.

___Type "C" Soil: easily penetrated, or if soil is submerged, seeping, or subject to water, runoff, etc.

Pentrometer or Shearvane: Used to estimate unconfined compressive strength of saturated soils.

Test Performed Yes___ No___

___Type "A" Soil: unconfined compressive strength of 1.5 tsf or greater.

___Type "B" Soil: unconfined compressive strength between 0.5 & 1.5 tsf

___Type "C" Soil: unconfined compressive strength of 0.5 tsf or less or if soil is submerged, seeping or subject to water, runoff, etc.

Wet Shake Test: Used to determine the percentage of granular and cohesive materials in a soil sample. Compare results to a soil textural classification chart.

___% granular ___% cohesive ___% silt

___Type "A" Soil: clay, silty clay, sandy clay, clay loam, and in some cases silty clay loam, and sandy clay loam

___Type "B" Soil: angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and in some cases silty clay loam, and sandy clay loam.

___Type "C" Soil: granular soil including gravel sand and loamy sand.

Note: Type A Soil - no soil is a Type A if the soil is fissured, subject to vibration previously disturbed, layered dipping into the excavation on a slope of 4H:1V.

Soil Classification

___Type "A" Soil ___Type "B" Soil ___Type "C" Soil

For selection of the appropriate protective system, use the flow chart in Appendix F of the Standard.

___Sloping or Benching (Appendix B) Specify Angle _____

___Timber Shoring (Appendix C)

___Aluminum Hydraulic Shoring (Appendix D)

_____ _____

Signature of Competent Person Date