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Focused Feasibility Study
Site 27

Naval Weapons Station Seal Beach Detachment Concord
Concord, California

GSA.0120.00003

DRAFT FINAL

October 14, 2003

NAVFAC

Engineering Field Activity West
Naval Facilities Engineering Command
Daly City, California

TETRA TECH, INC.

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Prepared for

DEPARTMENT OF THE NAVY
Engineering Field Activity West
Naval Facilities Engineering Command
Daly City, California

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ACRONYMS AND ABBREVIATIONS

40 CFR	Title 40 of the *Code of Federal Regulations*
ACM	Asbestos-containing materials
AOC	Area of contamination
ARAR	Applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
BDAT	Best Demonstrated Available Technology
BFI	Browning Ferris Industries
bgs	Below ground surface
BMP	Base Master Plan
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
C_{max}	Maximum detected concentrations
CAA	Clean Air Act
Cal/EPA	California Environmental Protection Agency
CCR	*California Code of Regulations*
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC	Chlorofluorcarbon
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
CNDDB	California Department of Fish and Game Natural Diversity Database
COC	Chemical of concern
COPC	Chemical of potential concern
CSF	Cancer slope factor
CTO	Contract task order
cy	cubic yard
DDD	Dichlorodiphenyldichloroethane
DoD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DTSC	Department of Toxic Substances Control
E&E	Ecology & Environment, Inc.
EFA WEST	Naval Facilities Engineering Command, Engineering Field Activities West
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FFA	Federal Facilities Agreement
FR	*Federal Register*
FS	Feasibility study
GRA	General response action
HHRA	Human health risk assessment
HI	Hazard index
HLA	Harding Lawson and Associates

ACRONYMS AND ABBREVIATIONS (Continued)

HQ	Hazard quotient
HSWA	Hazardous and Solid Waste Amendment
IAS	Initial assessment study
BMP	Base Master Plan
IRP	Installation restoration program
IT	International Technology Corporation
LDR	Land disposal restrictions
LUC RD	Land use control remedial design
mg/kg	Milligram per kilogram
NACIP	Navy Assessment and Control of Installation Pollutants
Navy	U.S. Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standard for Hazardous Air Pollutants
NPL	National Priorities List
O&M	Operation and maintenance
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCP	Pentachlorophenol
PPM	Part per million
PRC	PRC Environmental Management, Inc.
PRG	Preliminary remediation goal
PRG_{ca}	Preliminary remediation goal for cancer risk
PRG_{nc}	Preliminary remediation goal for noncancer risk
RACM	Regulated asbestos containing materials
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act
RfC	Reference concentrations
RfD	Reference dose
RI	Remedial investigation
RI/FS	Remedial investigation and feasibility study
RME	Reasonable maximum exposure
ROD	Record of Decision
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SARA	Superfund Amendment and Reauthorization Act
SBD	Seal Beach Detachment
SI	Site investigation
Site	Site 27, Naval Weapons Station Seal Beach Detachment Concord
SIP	State Implementation Plan
STLC	Soluble threshold limit concentration
SVOC	Semivolatile organic compound

ACRONYMS AND ABBREVIATIONS (Continued)

TBC	To be considered
TCLP	Toxicity characteristic leaching procedure
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
TPH-E	Extractable total petroleum hydrocarbon
TPH-D	Total petroleum hydrocarbon as diesel
TPH-G	Total petroleum hydrocarbon as gasoline
TPH-Mo	Total petroleum hydrocarbon as motor oil
TtEMI	Tetra Tech EM Inc.
TSCA	Toxic Substances Control Act
TTLC	Total threshold limit concentration
UCL_{95}	95 percentile upper confidence limit on the arithmetic mean
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Services
UST	Underground storage tank
UTS	Universal Treatment Standards
VOC	Volatile organic compound
WDR	Waste Discharge Requirements
WQEC	Weapons Quality Engineering Center

EXECUTIVE SUMMARY

Tetra Tech EM Inc. (TtEMI) has prepared this focused feasibility study (FS) report for Site 27, Naval Weapons Station Seal Beach Detachment Concord (Naval Weapons Station SBD Concord) located in Concord, California (Site 27).

INTRODUCTION

This focused FS has been prepared to present and evaluate remedial alternatives for addressing surface soil affected with organic chemical contaminants at Site 27. Site 27 currently comprises Buildings IA-20 and IA-36, a drainage swale, and a vadose zone well; Site 27 is also the former location of a 10,000-gallon diesel underground storage tank (UST). Building IA-20 formerly housed a chemical laboratory and a materials testing laboratory. Building IA-36 is a former boiler house. Both buildings were constructed in the 1940s and have concrete slab foundations. The 10,000-gallon diesel UST was formerly located among the southwestern side of Building IA-36. The UST and surrounding total petroleum hydrocarbon (TPH)-contaminated soil was removed in April 8, 1997, except where contaminated soil below Building IA-36 was inaccessible for removal (KTW & Associates 1997).

This focused FS report was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and with U.S. Environmental Protection Agency (EPA) guidance (EPA 1988) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The remedial alternatives that are evaluated vary in (1) effectiveness for protecting human health and the environment, (2) implementability, and (3) cost. The FS report was prepared using data that are also presented in the draft final Naval Weapons Station SBD Concord remedial investigation (RI) report (TtEMI 1997).

PREVIOUS INVESTIGATIONS

Several investigations have been conducted at Site 27. The paragraphs below summarize these investigations.

Initial Assessment Study

Initial site investigations were conducted from 1988 through 1990 to evaluate potential contamination resulting from activities and past disposal practices at buildings IA-20 and IA-36. The initial assessment study (IAS) did not designate Building IA-20 as a specific site; however, activities and past disposal practices at the building were reported. Site studies reported three past activities that may be of concern at Site 27 (around Buildings IA-20 and IA-36): (1) the IAS reported CFC-113 disposal behind Building

IA-20, although this contaminated soil was reportedly excavated and removed (Ecology & Environment, Inc. [E&E] 1983); (2) International Technology Corporation (IT) speculated that solvent disposal occurred in the area behind Building IA-20; and (3) IT also speculated that a burn pit was located behind Building IA-20.

Site Investigation

To investigate the nature and extent of contamination in soil at Site 27, a site investigation was conducted in 1992. During the site investigation, soil samples were collected from 20 locations at Site 27. There was no visible evidence during the site investigation of soil removal behind Building IA-20 to indicate that possible chlorofluorocarbon (CFC)-113-contaminated soil was removed from the area, as reported in the IAS. To investigate the reported disposal activities at Site 27, soil samples were analyzed for CFC-113, polychlorinated biphenyls (PCB), pesticides, pH, sulfate, TPH, and volatile organic compounds (VOC). The soil samples were field-screened for PCBs and TPH. Analytical laboratory results were used to verify the field screening results. No concentrations of CFC-113, chlorinated solvents, or PCBs were detected in the soil samples. Pesticides and low concentrations of VOCs were detected in soil.

UST Investigation and Removal

In September 1993, an investigation of the soil around the 10,000-gallon diesel fuel UST located along the southwestern side of Building IA-36 was conducted. On April 8, 1997, the UST was removed and soil was excavated down to 11 feet below ground surface (bgs) in a 10-foot-wide by 29-foot-long area. Additional excavation was conducted on the southern half of the tank pit to a depth of 25 feet bgs. No groundwater was encountered in the excavation. A sample collected from the southeastern sidewall of the excavation showed no TPH as diesel (TPH-D); benzene, toluene, ethylbenzene, and total xylenes (BTEX); pesticides; or PCBs in soil. It was concluded that diesel-impacted soil was substantially removed (KTW & Associates, Inc. 1997). The Contra Costa County Health Services Department issued a letter recommending no further action for the site on February 13, 1998 (Contra Costa County Health Services Department 1998).

Remedial Investigation

During 1996 and 1997, a remedial investigation was conducted at Site 27. As part of the remedial investigation, soil was sampled to determine the nature and extent of organochlorine pesticides, petroleum hydrocarbons, and semivolatile organic compounds (SVOC), VOCs, and geotechnical parameters such as grain size, permeability, porosity, density, specific gravity, and moisture content.

Some SVOCs or VOCs were detected at concentrations exceeding the EPA Region 9 preliminary remediation goal (PRG) residential values. The pesticides alpha-chlordane, gamma-chlordane, and 4,4'-dichlorodiphenyldichloroethane (4,4'-DDD) were also detected at concentrations exceeding residential PRG values. The pattern of pesticide detections indicates that pesticides were probably used for surface applications around buildings. Aroclor 1248 and 1254 were the only PCBs detected at Site 27; soil samples from three locations contained Aroclors at concentrations exceeding the residential PRG. In addition, TPH as motor oil was detected in samples collected from all sampling locations. No EPA PRGs are available for TPH as gasoline, TPH as diesel, or TPH as motor oil; however, PRGs are available for the TPH constituent indicator chemicals BTEX.

PRG-BASED HUMAN HEALTH RISK ASSESSMENT

A PRG-based human health risk assessment (HHRA) was completed for three areas at Site 27: (1) soil samples immediately adjacent to Buildings IA-20 and IA-36, (2) the entire site, excluding samples collected immediately adjacent to Buildings IA-20 and IA-36, and (3) the entire site (all soil samples included). The HHRA was conducted to evaluate potential human health risks associated with the chemicals detected in soil at the site. The results of the HHRA were originally presented in the remedial investigation report for Site 27 (TtEMI 1997) and have been updated in this FS report to incorporate current EPA Region 9 November 2000 PRGs (EPA 2000b). The updated HHRA is included as Appendix A.

The data evaluated in the HHRA included data collected during remedial investigation sampling event. Although land use at Site 27 will likely remain industrial, potential human health risks were estimated under both residential and industrial land-use scenarios. The HHRA was conducted as a PRG screen, using the maximum concentration of each detected chemical as the exposure point concentration (EPC). The PRG screening approach provided an expedited, but conservative, evaluation and identification of areas for (1) elimination as a site of concern if all concentrations were below PRGs, total cancer risks were less than 10^{-6}, and HIs were less than 1 or (2) requiring additional investigation or more detailed risk evaluation.

Current Versus Future Site Configurations

Analytical data for soil were divided into two subsets corresponding to the depth intervals evaluated in the HHRA. These two soil depth interval subsets are described below:

- **Current site configuration.** Surface soil subset for soil samples collected from 0 to 0.5 foot bgs; used to evaluate potential exposures associated with the current site configuration.

- **Future site configuration.** Subsurface soil subset for soil samples from 2 to 4 feet bgs; used to assess a future site configuration (under the assumption that subsurface soil will be mixed and redistributed to the surface as a result of regrading or excavation).

For health impacts associated with future site configuration scenarios, typically, chemical impacts down to 10 feet bgs are evaluated. Soil samples at Site 27, however, were not collected beyond 4 feet bgs as soil contamination was not observed at depth.

Perimeter of Buildings IA-20 and IA-36

For the perimeter of Buildings IA-20 and IA-36, cancer risk estimates for both the resident (3×10^{-5}) and the industrial worker (4×10^{-6}) are within the EPA's risk range of 10^{-4} to 10^{-6} for cancer risks. The HI of 2 estimated for the resident exceeds EPA's threshold of 1 for noncancer effects. Alpha- and gamma-chlordane accounted for approximately 87 percent of the total HI of 2. All industrial HIs are well below 1.0.

Site 27 Excluding the Perimeter of Buildings IA-20 and IA-36

For Site 27, excluding soil collected around the perimeter of Buildings IA-20 and IA-36, the current site configuration cancer risk estimates are 6×10^{-6} and 1×10^{-6} for the resident and the industrial worker, respectively. These estimates are within the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HI of 1 for the resident is equivalent to EPA's threshold of 1 for noncarcinogens. Aroclor-1248 and Aroclor-1254 account for approximately 99 percent of the total HI of 1. The estimated HI of 0.08 for the industrial worker is well below EPA's threshold of 1.0.

For the future site configuration (subsurface soil samples included), cancer risk estimates are 2×10^{-6} and 4×10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.2 and 0.02 for the resident and the industrial worker receptor, respectively, are well below EPA's threshold of 1.0 for noncarcinogens.

Entire Site

For the entire Site, current site configuration cancer risk estimates are 4×10^{-6} and 8×10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.6 and 0.05 for the resident and the industrial worker receptor are well below EPA's threshold of 1.0 for noncarcinogens.

For the entire site, the future site configuration (subsurface soil samples included) cancer risk estimates are 3×10^{-6} and 5×10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.4 and 0.03 for the resident and the industrial worker receptor, respectively, are below EPA's threshold of 1.0 for noncarcinogens.

Results and Conclusions

The results of the HHRA indicate the following.

- At the perimeter of Buildings IA-20 and IA-36, potential adverse human health effects may occur due to exposure to chlordane in surface soil under a residential land-use scenario. No adverse human health effects are indicated under an industrial land-use scenario.
- At Site 27 excluding the perimeter of Buildings IA-20 and IA-36, no potential adverse human health effects were indicated under a residential or industrial land-use scenario.
- At the entire site, no potential adverse human health effects were indicated under a residential or industrial land-use scenario.

The results of the HHRA indicate that under the anticipated industrial land-use scenario, chemicals detected at Site 27 do not pose an unacceptable risk; therefore, remedial action is unnecessary for the protection of human health. However, this focused FS is intended to evaluate remedial actions at the perimeter of Buildings IA-20 and IA-36 that would be needed to support the possibility of unrestricted uses of Site 27 in the future.

SETTING REMEDIAL ACTION OBJECTIVES

The sole medium of concern at Site 27 is affected surface soil. Groundwater is not a medium of concern because the contaminants present in site soil are found at depths much shallower (less than 1.0 foot bgs) than anticipated groundwater depths (estimated at 30 feet bgs) and are not expected to leach and travel to the groundwater. In addition, chlordane is likely to remain sorbed to soil and is relatively immobile and thus, is not expected to migrate vertically to the groundwater table. Under this same rationale, surface water runoff from the site is also not a medium of concern. Surface water bodies are not present in the immediate vicinity of Site 27.

To address the concern for human health risks under an unrestricted land-use scenario (including residential use) remedial action objectives (RAO) were set to identify, develop, and evaluate remedial alternatives. RAOs for the unrestricted land use scenario are to prevent exposure by human receptors via ingestion of, direct contact with, or inhalation of chlordane in soil from 0.0 to 1.0 foot bgs at concentrations greater than the established EPA Region 9 residential level PRG for chlordane of 1.6 mg/kg.

EVALUATION OF THREE REMEDIAL ALTERNATIVES

Three remedial alternatives for soil were identified and developed under the FS.

Alternative 1: No Action

Under this alternative, no remedial action would be taken. Rather, site soil would be left as is, without implementation of land use controls, containment, treatment, or removal. The no action alternative has been included for comparative analysis as required under CERCLA.

Alternative 2: Land Use Controls

This alternative includes land use restrictions to ensure that any future use of Site 27 is consistent with its current industrial uses. Land use restrictions for Site 27 under this alternative would be identified in the Real Estate Summary/Base Mapping System , the Base Master Plan (BMP) and or other Navy Planning documents required for land/facility development. All potential changes to the future land use of the site would be identified and controlled through the "site approval process" during the Navy's project planning and development activities. Encumbrances, constraints, and restrictions identified in the Real Estate Summary/Base Mapping system and BMP would determine whether approval for any changes would be granted in future land use of the site. The Navy also will develop a land use control remedial design (LUC RD), as part of the final remedial design for the site, to ensure implementation of land-use restrictions. The LUC RD will explain how institutional controls will be established, documented, maintained and managed.

Alternative 3: Building Demolition and Debris Disposal/Soil Excavation and Incineration Off-Site

This alternative includes demolition of Buildings IA-20 and IA-36 with excavation and off-site incineration of approximately 330 cubic yards of soil presenting a potential human health risk.

Each remedial alternative was individually evaluated against the nine CERCLA criteria, followed by a comparative analysis to evaluate the relative performance of the remedial alternatives.

Results of Comparison of Alternatives

The individual and comparative analyses indicate that Alternatives 2 and 3 would provide acceptable levels of protection of human health and the environment and long-term effectiveness, and would comply with applicable or relevant and appropriate requirements (ARAR). Alternative 1 presents no short-term risks, has no action to implement, and has no cost. Alternative 1 does not provide adequate protection for human health under unrestricted future use, thus it is not a viable alternative. Alternative 3 will reduce the toxicity, mobility and volume of contaminants, while Alternative 2 will restrict exposure. Both these alternatives were ranked similarly. Alternative 2 is lower in cost.

1.0 INTRODUCTION

Tetra Tech EM Inc. (TtEMI), under direction from the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command Engineering Field Activity West (EFA West), has prepared this focused feasibility study (FS) report for Site 27 at the Naval Weapons Station Seal Beach Detachment (SBD) Concord in Concord, California. This work has been conducted under Delivery Order (D) No. N62474-03-F-4033 pursuant to the General Services Administration (GSA) Contract No. GS-10F-0076K.

Previous investigation activities conducted at Site 27 have identified the presence of several organics in the soil at concentrations above U.S. Environmental Agency (EPA) Region 9 preliminary remedial goals (PRG) for residential soil. A preliminary remediation goal-based human health risk assessment (HHRA) was completed for three areas at Site 27: (1) soil samples collected immediately adjacent to Buildings IA-20 and IA-36, (2) the whole site, excluding samples collected immediately adjacent to Buildings IA-20 and IA-36, and (3) the whole site (all soil samples included). The HHRA was conducted to identify potential human health concerns at Site 27 and chemicals driving those risks. The results of the HHRA indicate that under a residential land-use scenario, potential adverse human health effects may occur due to exposure to chlordane in surface soils along the perimeter of Buildings IA-20 and IA-36. Chlordane concentrations were not found to be a concern to human health under the anticipated future industrial land-use scenario. However, this FS has been developed to identify and evaluate a set of remedial alternatives to prevent exposure, and eliminate or reduce risks posed by chlordane if the land use changes to residential use.

No significant ecological habitat exists at Site 27, which is confined to a small geographical area. Biological surveys conducted for the Inland Area and review of the California Department of Fish and Game Natural Diversity Database (CNDDB) indicate that no special status plants, birds, mammals, or reptiles occur at the site (CDFG 2001; Downard 1999). An ecological risk assessment was not conducted for Site 27 because of the limited area of the assessment and lack of significant habitat.

The purpose of this FS is to identify and evaluate a set of remedial alternatives to eliminate or reduce risks posed by chlordane to human receptors. This FS has been prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is conducted as part of the Installation Restoration Program (IRP) at the Naval Weapons Station. As part of this program, the U.S. Department of Defense (DoD) is identifying, evaluating, and remediating past hazardous waste sites. This work is coordinated through a Federal Facilities Agreement (FFA) negotiated and signed on June 14, 2001. The Navy initiated environmental studies at the Naval Weapons Station under a precursor to the current IRP entitled, “Navy Assessment and Control of Installation Pollutants” (NACIP), in 1983. EPA placed NWS SBD Concord on the National Priorities List (NPL) on December 16, 1994. Although the Inland Area of the installation is not active, the installation is not slated for closure in the foreseeable future. In addition to the Navy, other branches of the DoD reside within or partly occupy Site 27, including the U.S. Army.

1.1 PURPOSE AND ORGANIZATION OF REPORT

The purpose of this report is to develop and evaluate a range of remedial alternatives that (1) eliminate or reduce unacceptable human health exposures to contaminated soil at Site 27; (2) minimize effects of contaminants on the environment; and (3) are feasible, implementable, and cost effective.

The organization of this report generally follows the suggested format found in the interim final EPA document, “Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA” (EPA 1988). EPA guidance points out that where “circumstances limit the number of available options, and therefore the number of alternatives that are developed, it may not be necessary to screen alternatives prior to the detailed analysis” (EPA 1988). Because one of the principal purposes of this focused FS is to evaluate a limited number of risk control alternatives for an unrestricted land use (not the anticipated future use of Site 27), this FS has been streamlined in accordance with EPA guidance. This FS limits the number of remedial alternatives developed and eliminates the step of screening both process options and remedial alternatives before detailed analysis. This FS report therefore includes the following steps:

- Summarize previous investigation and risk assessment results.
- Develop remedial action objectives (RAO).
- Develop general response actions (GRA) that address the RAOs.
- Identify and develop a set of three remedial alternatives.
- Further evaluate the remedial alternatives through detailed analysis.
- Present a comparative analysis of the remedial alternatives.

The FS report contains six sections and two appendices. Section 1.0 describes the purpose and organization of the FS report. Section 2.0 describes the site history and develops a site profile, including a summary of past site investigation activities, site geology and hydrogeology, nature and extent of contamination, and contaminant fate and transport. Section 3.0 develops the RAOs for Site 27, presents GRAs, and identifies three remedial alternatives to be further evaluated. Section 4.0 provides a detailed analysis of the remedial alternatives. Section 5.0 includes a comparative analysis of the remedial alternatives. Section 6.0 lists references cited in this report. Appendix A includes the HHRA and

Appendix B includes cost details and estimates for Alternatives 2 and 3. Appendix C provides responses to agency comments on the Draft FS.

2.0 BACKGROUND

Naval Weapons Station SBD Concord is the major munitions trans-shipment facility on the West Coast. It is located in the north-central portion of Contra Costa County, California, approximately 30 miles northeast of San Francisco (Figure 2-1). The facility encompasses approximately 13,000 acres and is bounded by Suisun Bay to the north, the Los Medanos Hills to the east, and the city of Concord to the south and west. Currently, the facility contains two separate primary land holdings divided by State Route 4, including the Tidal Area and the Inland Area (Figure 2-1). Site 27 is located within the northern portion of the Inland Area (Figure 2-1).

Site 27 is located on the east side of H Street, approximately 800 feet south of State Highway 4 (Figure 2-1). Site 27 is located at 95-foot elevation on the side of a hill sloping westward toward H Street. Site 27 comprises Building IA-20, Building IA-36, a drainage swale, and a vadose zone well; a 10,000-gallon fuel underground storage tank (UST) was formerly located southwest of Building IA-36 (Figure 2-2).

2.1 HISTORY AND SETTING

Facilities located in the greater Inland Area of the installation are dedicated to ordnance operations and are located on the original property of the Naval Magazine, Port Chicago, acquired by the Navy in 1942. Various production facilities for the inspection and maintenance of ordnance are located throughout the Inland Area.

Site 27 currently comprises building IA-20, building IA-36, a drainage swale, and a vadose zone well; Site 27 is also the former location of a 10,000-gallon diesel UST. These buildings are located at the northern end of a cluster of buildings and are situated on a slight rise above a driveway and parking area. North of Buildings IA-20 and IA-36 is the drainage swale, which drains to the west, away from the Contra Costa Canal and into the flat lands west of H Street. Above the drainage swale, a steep grass- and brush-covered hill slopes to the southwest. The Contra Costa Canal is approximately 150 feet upslope from the site. Farther upslope is the State Highway 4 causeway (see Figure 2-3).

Building IA-20, which was constructed in 1947 and has a concrete slab foundation, formerly housed a chemical laboratory and a materials testing laboratory of the Weapons Quality Engineering Center (WQEC) Scientific and Engineering Division. The laboratory recently ceased operations and is vacant. The chemical laboratory was used primarily to test oils and hydraulic fluids and to develop new weapons test methods. The materials testing laboratory evaluated the structural integrity and dynamics of ordnance casings, shells, and missiles. The IAS reported that the amount of laboratory waste generated was less than 100 pounds per year (no year cited) and consisted mostly of test fluids and steel, brass, and aluminum scraps and shavings. The IAS (E&E 1983) report listed the following annual wastes generated by the laboratory (no year cited):

Chlorofluorocarbon (CFC)-113	100 gallons
Denatured alcohol	50 gallons
Mineral spirits	50 gallons
Oil	50 gallons

Additional small quantities of acids and bases were generated at the laboratory. These latter wastes were neutralized and introduced into the sewer with permission from Contra Costa County Utilities District. Since 1983, the laboratory has collected and disposed of its waste off site (E&E 1983).

Building IA-36, which was constructed in 1946 and has a concrete slab foundation, is a former boiler house. The former location of a 10,000-gallon diesel UST is along the southwestern side of Building IA-36. The tank reportedly passed a 1989 tank pressure test (ERM-West 1989). During field activities in July 1992, however, it was observed that soil had been removed from the top of the tank and the word "leaking" was written on the tank. The soil near the tank was visibly stained and emitted a strong hydrocarbon-like odor. The UST and surrounding total petroleum hydrocarbon contaminated soil was removed in 1997, except where contaminated soil below Building IA-36 was inaccessible for removal (KTW & Associates 1997).

2.2 SITE PROFILE

The following sections discuss the facility setting of Site 27, including (1) summary of site investigation activities, (2) geology, (3) hydrogeology, (4) nature and extent of contamination, (5) contaminant fate and transport, (6) screening-level human health risk assessment, and (7) applicable or relevant and appropriate requirements.

2.2.1 Summary of Site Investigation Activities

Several investigations have occurred at Site 27, dating back to the late 1980s. Previous site investigation activities are described below; they include an IAS (E&E 1938), site investigation (SI) (PRC and Montgomery Watson 1993), underground storage tank removal (KTW & Associates 1997), and remedial investigation (RI) (TtEMI 1997). Sampling results from the previous investigations are summarized in Table 2-1.

2.2.1.1 Initial Assessment Study

The IAS was conducted in 1983 to evaluate potential contamination resulting from activities and past disposal practices at Buildings IA-20 and IA-36. The IAS did not designate Building IA-20 as a specific site; however, activities and past disposal practices at the building were reported (E&E 1983). The IAS report stated that between 1964 and 1968, personnel routinely disposed of chlorofluorcarbon (CFC)-113 by pouring the chemical onto the soil behind Building IA-20 at a rate of 1 gallon per week. Two subsequent investigations were conducted to verify the results of the IAS from 1988 to 1990.

Site 18, near Building IA-25 in the central portion of the Inland Area, was identified as a suspected burn pit and solvent disposal area in the IAS. Because subsequent investigations showed no evidence of those activities at Site 18, International Technology Corporation (IT) concluded that the IAS report incorrectly identified Building IA-20 activities as occurring at Building IA-25, and concluded that the Site 18 activities reported in the IAS report occurred at Building IA-20. Subsequently, the Building IA-20 area was designated as Site 27 (IT 1989).

Site studies reported three past activities that may be of concern at Site 27 (Buildings IA-20 and IA-36): (1) the IAS report described CFC-113 disposal behind Building IA-20, although this contaminated soil was reportedly excavated and removed (E&E 1983); (2) IT speculated that solvent disposal from laboratory wastes possibly occurred in the area behind Building IA-20, and (3) IT also speculated that a burn pit was possibly located behind Building IA-20.

2.2.1.2 Site Investigation

To investigate the nature and extent of contamination in soil at Site 27, an SI was conducted in 1992. During the SI, soil samples were collected from 20 locations at the site, as shown on Figure 2-3. The sample results are presented in Table 2-1 (PRC and Montgomery Watson 1993).

There was no visible evidence during the SI of soil removal behind Building IA-20 to indicate that possible CFC-113-contaminated soil was removed from the area, as reported in the IAS report. To investigate the reported disposal activities at Site 27, soil samples were analyzed for CFC-113, polychlorinated biphenyls (PCB), pesticides, pH, sulfate, TPH, and volatile organic compounds (VOC). The soil samples were field-screened for PCBs and TPH. Analytical laboratory results were used to verify the field screening results.

No CFC-113, chlorinated solvents, or PCBs were detected in the soil samples. Chemical concentrations of pesticides, TPH, and VOCs detected in soil are presented in Table 2-1. All pesticide and VOC concentrations were well below EPA Region 9 residential PRGs, with the exception of dieldrin in one sample. TPH as was detected in the drainage swale and near the former UST. The pH in the soil samples ranged from 7.7 to 9.36 and sulfate concentrations ranged from 4.54 to 43.10 mg/kg

2.2.1.3 UST Investigation and Removal

In September 1993, an investigation of the soil around the 10,000-gallon diesel fuel UST located along the southwest side of Building IA-36 was conducted. One boring was drilled along the southwestern side of the UST. Samples were collected at depths of 7.5, 11, and 16 feet below ground surface (bgs) and were analyzed for TPH as diesel (TPH-D), TPH as gasoline (TPH-G), and pesticides. TPH-D was detected at 620 milligrams per kilogram (mg/kg) in the sample collected at 11 feet bgs (Harding Lawson and Associates [HLA] 1995). The base of the UST was measured at approximately 10 feet bgs.

On April 15, 1997, the UST was excavated and removed, and soil beneath was excavated to 11 feet bgs in a 10-foot-wide by 29-foot-long area. Two soil samples were collected at the bottom of the excavation and were analyzed for TPH-D; benzene, toluene, ethylbenzene, and total xylenes (BTEX); pesticides; and PCBs; one sample was collected at the southern end of the excavation and one sample was collected at the northern end of the excavation. No pesticides or PCBs were detected in either soil sample. Laboratory results from the sample collected at the northern end showed no detectable TPH-D or BTEX; however, the sample collected from the southern end of the excavation contained TPH-D (950 mg/kg), ethylbenzene (0.66 mg/kg), and total xylenes (1.8 mg/kg).

Because the soil sample in the southern portion of the tank pit indicated that soil was impacted with petroleum hydrocarbons, an additional excavation occurred on April 28, 1997; the southern half of the tank pit was excavated to a depth of 25 feet bgs. No groundwater was encountered in the excavation. At the time of the second excavation, a block of soil and bedrock underlying a portion of Building IA-36 caved into the excavation; the concrete floor of a portion of Building IA-36 was exposed by the undercaving. The mass of material backfilled the overexcavated area from 25 to 21 feet below grade. Additional excavation was not performed because of the potential instability of the sidewall beneath Building IA-36, and clean, imported backfill material was placed in the excavation to provide a buttress against further caving (KTW & Associates 1997). Before placing backfill material into the excavation, one soil sample was collected from the southeastern sidewall at a depth of 19-feet bgs. No BTEX, PCBs, pesticides, or TPH-D, were detected in the sample.

Diesel-impacted soil was considered substantially removed (KTW & Associates 1997). The Contra Costa County Health Services Department issued a letter to the Navy recommending no further action for the site on February 13, 1998 (Contra Costa County Health Services Department, 1998).

2.2.1.4 Remedial Investigation

In 1996 and 1997, an RI was conducted at Site 27. As part of the RI, soil was sampled at 15 locations to determine the nature and extent of organochlorine pesticides, petroleum hydrocarbons, and semivolatile organic compounds (SVOC) at the site. Fifteen surface soil samples were analyzed for PCBs, pesticides, SVOCs, and extractable TPH (TPH-E). In addition, three subsurface samples were collected at 3.0 feet bgs and were analyzed for PCBs, pesticides, SVOCs, total organic carbon (TOC), TPH-E, VOCs, and geotechnical parameters such as grain size, permeability, porosity, density, specific gravity, and moisture content.

The analytical results of sampling are presented in Table 2-1 and are compared to the EPA Region 9 PRGs developed for residential soil (EPA 2000b). Geotechnical testing results are summarized in Table 2-2.

2.2.1.5 SVOCs and VOCs

No SVOCs were detected at concentrations exceeding the EPA Region 9 residential PRG values (Table 2-1). No VOCs were detected in subsurface samples collected in the drainage swale. The presence of pentachlorophenol (PCP) in building perimeter sample MTLSB017 suggests its use as an insecticidal wood preservative at that location; otherwise, the SVOCs detected at Site 27 do not exhibit any distinct pattern of distribution.

2.2.1.6 PCBs and Pesticides

Pesticides were detected at concentrations exceeding the EPA Region 9 residential PRG values only in surface soil samples collected from building perimeter samples MTLSB014, MTLSB017, and MTLSB018 (Figure 2-2). Alpha-chlordane and gamma-chlordane were detected in these samples at concentrations up to 24 mg/kg and 23 mg/kg, respectively, which exceed the chlordane PRG value of 1.6 mg/kg (Figure 2-2).

The pesticide 4,4'-dichlorodiphenyldichloroethane (4,4'-DDD) was detected in surface soil sample MTLSB018 near the perimeter of Building IA-20 at a concentration of 8.2 mg/kg, which is above the PRG of 2.4 mg/kg; 4,4'-DDD concentrations were below the PRG in all other soil samples (Figure 2-2). The pattern of pesticide detections indicates that pesticides were probably used for surface applications around buildings.

Arolcor 1248 and 1254 were the only PCBs detected at Site 27. Soil samples from locations MTLSB010, MTLSB013, and MTLSB020 contained Aroclors at concentrations exceeding the EPA Region 9 residential PRG of 0.22 mg/kg. Sample MTLSB013, located on the drainage swale bank surface, contained the highest detected concentration of Aroclors; in that sample, Aroclor-1248 and 1254 were detected at concentrations of 0.5 and 1.0 mg/kg, respectively. PCBs were not detected in any subsurface soil samples or in samples collected around the building perimeters. The source of PCBs is unknown, but could potentially be from the oil used in machinery for testing shell casings. PCBs are typically found in electrical transformer fluid, hydraulic fluids, and cutting oils.

2.2.1.7 TPH Constituents

TPH as motor oil (TPH-Mo) was detected in samples collected from all sampling locations (Table 2-1). The highest concentration of TPH-Mo (12,000 mg/kg) was detected in surface sample MTLSB018, collected at the Building IA-36 UST. TPH-D was also detected in this sample at a concentration of 540 mg/kg. Soil at this location was removed and replaced with clean backfill during the UST removal in 1997 (KTW & Associates 1997); therefore TPH constituents no longer exist at that location. No EPA Region 9 PRGs are available for TPH constituents.

TPH-Mo also was detected at concentrations ranging from 19 mg/kg to 7,400 mg/kg. Elevated TPH detections at sample MTLSB015 (7,400 mg/kg) may be the result of fuel oil handling.

TPH-G was detected in two samples at a maximum concentration of 0.35 mg/kg. There are no established PRGs for TPH in soil, and concentrations of gasoline detected at this low level are not a concern for further evaluation.

2.2.2 Geology

Regional geologic features include several northwest-trending fault systems that divide Contra Costa County into large tectonic blocks. An uplifted block feature topographically separates the Inland and Tidal areas.

Two major faults are known to exist at or near Site 27: the Concord and Clayton faults. The Concord Fault passes approximately 2 miles south of the site and is classified as a right-lateral strike-slip fault. The Clayton Fault lies at the base of Los Medanos Hills as it passes through the Naval Weapons Station. Broad lowlands are underlain by thick, unconsolidated Pleistocene-age alluvial sediments eroded from up-thrown blocks.

Soil in the north-central portions (Tidal Area) of the installation is clay-rich alluvium derived from nearby hills. This soil consists of well-sorted, pebbly alluvium from upstream areas of Mt. Diablo Creek. Soil in the central area (Inland Area) tends to be coarser at shallow depths but becomes comparatively finer at deeper depths than does soil in the north-central area.

The surface geology of the Inland Area is divided into two alluvial areas. The surface geology of the Tidal Area is composed of alluvial formations derived from erosion products associated with the geologic units of Los Medanos Hills intermixed with deltaic sediment from Suisun Bay. The second area consists of Quaternary-age sedimentary formation and alluvial byproducts in the low and gently sloped hills to the southwest. Alluvium in this area consists of beds of sandy, silty, and clayey soil, which are detrital deposits made by streams or riverbeds. Silty soil appears to be most common. A 3-foot-thick layer of dark brown or gray, clayey soil is consistently present on the alluvium throughout the region (PRC 1996). Bedrock at the Inland Area is a Pliocene nonmarine sedimentary rock formation.

Limited geologic information is available for Site 27. Existant information is based on the 25-foot bgs excavation for the UST Closure and a series of shallow soil borings (less than 4.5 feet bgs). Based on the information available, the soil beneath Site 27 appears to consist of primarily clay, silty clay, and sandy clay with a few interbedded sand stringers.

2.2.3 Hydrogeology

Site 27 lies within the Mt. Diablo/Seal Creek Watershed, which drains an area of approximately 36 square miles. This watershed is bounded on the north by Suisun Bay and on the south by the northern peak of Mt. Diablo. Streams that drain the watershed have their headwaters on the slopes of Mt. Diablo and flow via Mt. Diablo Creek through Clayton Valley and the installation to the outlet at Suisun Bay. Mt. Diablo Creek is known as Seal Creek where it enters the installation (PRC 1996).

Groundwater levels have not been recorded at Site 27, but it is known to be below 25 feet bgs. During excavation of the UST at Building IA-36, no groundwater was encountered at 25 feet bgs (KTW & Associates 1997). Based on local topography, the groundwater is estimated to flow generally to the west-southwest.

Several groundwater wells in the vicinity of the nearby Mallard Reservoir, approximately 0.75 mile west of the Inland Area, are used for firefighting at a nearby petroleum refinery. Groundwater is available beneath the Inland Area in the unconsolidated formations and the bedrock. North of State Route 4, the water table ranges from a depth of 30 to 40 feet bgs in low surface elevation areas and is at greater depth as ground surface rises. Local variations in groundwater flow direction occur due to man-made structures and natural variations in local surface and subsurface features.

2.2.4 Nature and Extent of Contamination

This report references the results of the SI, UST closure report, and the RI to quantify the nature and extent of the contamination at Site 27. The results of the HHRA, discussed in Section 2.2.5 below, identify the following chemicals of concern (COC) with threshold hazard index (HI) above 1 in the soil at Site 27 under the unrestricted reuse scenario for a resident: the pesticides alpha-chlordane and gamma-chlordane in surface soil near Buildings 1A-20 and IA-36. No chemicals at the site were above the EPA target risk range of 10^{-6} to 10^{-4}.

Alpha-chlordane was detected in 22 of 31 soil samples at concentrations ranging from 0.001mg/kg to 24 mg/kg. Alpha-chlordane concentrations in surface soil samples MTLSB014 (24 mg/kg), MTLSB018 (13 mg/kg), and MTLSB017 (4.3 mg/kg) near the perimeter of Buildings IA-20 and IA-36 exceeded the residential PRG of 1.6 mg/kg; all other alpha-chlordane concentrations were below the EPA Region 9 residential PRG. The soil at location MTLSB018 has since been excavated and backfilled with clean soil as part of the UST removal at Building IA-36 (KTW & Associates 1997). No subsurface soil samples contained concentrations of alpha-chlordane above the PRG.

Gamma-chlordane was detected in 19 of 31 soil samples at concentrations ranging from 0.001 mg/kg to 23 mg/kg. Surface soil samples MTLSB014 (23 mg/kg), MTLSB018 (12 mg/kg), and MTLSB017 (4.3 mg/kg) near the perimeter of Buildings IA-20 and IA-36 exceeded the EPA Region 9 residential PRG of 1.6 mg/kg; all other gamma-chlordane concentrations were below the residential PRG. The soil at location MTLSB018 has since been excavated, and the excavation has been backfilled with clean soil as part of the UST removal at Building IA-36 (KTW & Associates 1997). No subsurface soil samples contained concentrations of gamma-chlordane above the residential PRG.

No groundwater sampling has been conducted at Site 27. The previous SI report prepared for Site 27 (IT 1992), as accepted and approved by the regulatory agencies, did not identify groundwater as a potential medium of concern. As discussed in Section 2.2.5 below, groundwater contamination is not suspected because the contamination is shallow relative to anticipated groundwater levels at the site. Additionally, the organic COCs at Site 27 are relatively immobile in both soil and groundwater.

2.2.5 Human Health Screening-level Risk Assessment

A PRG-based HHRA was completed for three areas at Site 27: (1) soil samples immediately adjacent to Buildings IA-20 and IA-36; (2) the entire site, excluding samples collected immediately adjacent to Buildings IA-20 and IA-36; and (3) the entire site (all soil samples included). The HHRA was conducted to evaluate potential human health risks associated with the chemicals detected in soil at Site 27. The results of the HHRA were originally presented in the RI report for Site 27 (TtEMI 1997) and have been updated in this FS report to incorporate current EPA Region 9 November 2000 PRGs (EPA 2000b). The updated HHRA is included as Appendix A and is summarized below. Results of the HHRA are summarized in Table 2-3.

The HHRA was conducted as a PRG screen, using the maximum concentration of each detected chemical as the exposure point concentration (EPC). The PRG screening approach provided an expedited, but conservative, evaluation and identification of areas for (1) elimination as an area of concern if all concentrations were below PRGs, total cancer risks were less than 10^{-6}, and HIs were less than 1 or (2) requiring additional investigation or more detailed risk evaluation.

The methods used to conduct this PRG-based HHRA for Site 27 are based on EPA and California Environmental Protection Agency (Cal/EPA) risk assessment guidance, as noted below:

- "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, (Part A)" (EPA 1989)
- Region 9 PRGs Memorandum (EPA 2000)
- "Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities" (Cal/EPA 1992)
- "Recommended Outline for Using U.S. Environmental Protection Agency Region 9 Preliminary Remediation Goals in Screening Risk Assessments at Military Facilities" (Cal/EPA 1994).

Although land use at Site 27 will likely remain industrial, potential human health risks were estimated for both residential and industrial land-use scenarios.

The EPA and Cal/EPA risk assessment framework consists of the following four basic steps:

Step 1 – Data Evaluation and Selection of Chemicals of Potential Concern (COPC)
Step 2 – Exposure Assessment
Step 3 – Toxicity Assessment
Step 4 – Risk Characterization

More detail on these components is included in Section A.1.4 of Appendix A and is summarized below. The results and conclusions of the HHRA are summarized in Section 2.2.5.1 through 2.2.5.6 below, and in Section A1.11 of Appendix A. Appendix A presents summary tables, including residential and industrial cancer risks and noncancer HI results, maximum detected concentrations, and EPA Region 9 residential and industrial soil PRGs.

2.2.5.1 Data Evaluation and Identification of COPCs

The data evaluated in the HHRA included all soil data collected as part of the RI at Site 27. The complete set of data used in the PRG-based HHRA is presented in Attachment A1. As explained in the HHRA report (Section A.1.5.2), composite soil samples collected as part of the SI were not used for the HHRA evaluation because they are composite samples that combine information from up to three locations. The maximum detected concentrations in composite soil samples were all below residential PRGs, with the exception of dieldrin in sample MTL-05-CSS (0.07 mg/kg), which was slightly above the residential PRG of 0.03 mg/kg. In RI samples, dieldrin was detected in only one sample, at a concentration (0.006 mg/kg) well below the residential PRG.

Analytical data for soil were divided into two subsets corresponding to the depth intervals evaluated in the HHRA. These two soil depth interval subsets are described below:

- Surface soil subset for soil samples collected from 0 to 0.5 foot bgs; used to evaluate potential exposures associated with the current site configuration.
- Subsurface soil subset for soil samples from 2 to 4 feet bgs; used to assess a future site configuration (under the assumption that subsurface soil will be mixed and redistributed to the surface as a result of regrading or excavation).

For health impacts associated with future site configuration scenarios, typically, chemical impacts down to 10 feet bgs are evaluated. Soil samples at Site 27, however, were not collected beyond 4 feet bgs.

Potential health impacts for current and future site configurations were evaluated for the following:

- Samples collected around the perimeter of Buildings IA-20 and IA-36 (current configuration only).
- Samples collected from the whole site, excluding at the perimeter of Building IA-20 and IA-36 (current and future site configuration assessed).
- The entire Site (current and future site configuration assessed).

Samples collected from four locations were used to represent conditions at the perimeter of Buildings IA-20 and IA-36: MTLSB014; MTLSB017; MTLSB018; and MTSB019. The remaining soil samples were used to represent conditions at the site excluding the area occupied by the two buildings. Soil conditions underneath the buildings are unknown.

Identification of Chemicals of Potential Concern

COPCs are chemicals included in the quantitative exposure estimation and risk characterization steps of the HHRA. Except for TPH, if a chemical was detected at least once in soil, it was retained as a COPC. Petroleum indicator results (such as gasoline) were not selected as COPCs. As recommended by Cal/EPA (1993), the principal toxic constituents in petroleum products (that is, BTEX, other individual monocyclic aromatic compounds, polycyclic aromatic hydrocarbons (PAH), and other component compounds that have published toxicity values assigned by EPA or Cal/EPA) were instead evaluated to assess potential health risk from TPH contamination. TPH mixture data were excluded from further evaluation in the risk assessment because they are considered inadequate and insufficient to evaluate risk from TPH contamination (Cal/EPA 1993).

Soil data are summarized in Tables A-2 through A-6 of Appendix A for each area evaluated. SVOCs, organochlorine pesticides, and PCBs were identified as COPCs.

2.2.5.2 Exposure Assessment

Potential human health risks associated with chemicals detected in soil at Site 27 were conservatively evaluated under both the industrial and unrestricted land-use scenarios (residential).

Receptor Selection

The selection of current receptors is based on current land use activities at Site 27. The primary receptors identified are base personnel. For purposes of the HHRA, activities of current base personnel were assumed to be similar to those of an industrial worker, as defined by the EPA (2000). Base visitors were also identified as potential receptors. A separate screening-level assessment of potential base visitor risks was not made because the exposure and risk estimates for an industrial worker are expected to provide an upperbound estimate of risks for a visitor (that is, will conservatively over-estimate exposures to a visitor). The EPA (2000) industrial soil PRGs were used to assess risk associated with current industrial (base) worker exposure to COPCs detected in soil at Site 27.

Potential future receptors were identified based on projected future land use and probable future activity patterns at each site. The most probable future receptors are base personnel; a future industrial (base) worker was therefore identified as a potential future receptor. However, although very unlikely, it was conservatively assumed that land use may be unrestricted in the future and that residential developments may be constructed at the site. The EPA (2000) residential soil PRGs were used to assess risk associated with hypothetical future residential exposure to COPCs detected in soil at Site 27.

The frequency and duration of exposure to soil COPCs assumed for the industrial and residential receptors are specifically defined in the EPA Region 9 PRGs memorandum (EPA 2000b).

Exposure Pathways

The exposure pathways evaluated for potential receptors under both the residential and industrial land-use scenarios include the following:

- Incidental ingestion of soil
- Inhalation of particulates and volatile compounds emitted from soil
- Dermal contact with soil

Exposure Point Concentration

"Exposure point" describes a location or area, often hypothetical, where human receptors might encounter one or more contaminated environmental media. The concentrations of COPCs assumed to be present at an exposure point are referred to as EPCs. In a baseline HHRA, EPCs are estimated for each exposure medium (such as soil). EPCs were calculated for all COPCs identified for the current site configuration (0 to 0.5 foot bgs) and the future site configuration (0 to 4 feet bgs) at Site 27. Because PRGs in soil account for the inhalation of vapors and particulates, EPCs in air were not estimated for any COPCs.

Based on EPA guidelines, the EPCs used in a risk assessment are the lesser of the maximum detected concentration and the 95th percentile upper confidence limit on the arithmetic mean (UCL_{95}) (EPA 1992). This value represents an "upperbound" or a reasonable maximum exposure (RME) estimate of chemical concentrations. However, Cal/EPA indicates that the maximum concentration of each contaminant should be used as the EPC for comparisons against PRGs for screening-level risk assessments (Cal/EPA 1994). To address potential Cal/EPA concerns, cancer risks and HIs were estimated using maximum detected COPCs concentrations, and the results are summarized in Appendix A, Attachment A1. Soil EPCs for all COPC are summarized in Tables A-2 through A-6.

2.2.5.3 Toxicity Assessment

Typically, the toxicity assessment involves a review of agency literature and the subsequent compilation of cancer slope factors (CSF) and reference doses (RfD) that are used to estimate cancer risks and HIs. Issues regarding evaluation of appropriate toxicity values that include selecting appropriate surrogate toxicity values, route-to-route extrapolation, and an analysis of sources used to identify and select toxicity values also are considered. However, the development of PRGs already incorporates the results of these analyses. A complete list of all toxicity values used to develop the PRGs is presented in the PRG table (EPA 2000b).

For some carcinogens, separate PRGs are available to assess their carcinogenic effects and their noncancer adverse health effects (EPA 2000b). For these compounds, both the cancer risks and potential for noncancer adverse health effects were evaluated. Additional issues related to PRGs, including the selection of PRGs when more than one value was available, are discussed in Appendix A. Table A-7 lists the soil PRGs and the surrogates used in this assessment.

2.2.5.4 Risk Characterization

The risk characterization process combines the results of the exposure and toxicity assessments to separately address cancer risk and the risk of adverse noncancer health effect. The risk characterization estimates the potential excess lifetime cancer risk and the potential for noncancer adverse health effects for the identified receptors (industrial workers and hypothetical residents) from potential exposure to COPCs in soil at Site 27. This section summarizes the methods used to estimate noncancer effects and excess lifetime cancer risks, and presents the risk characterization results.

Consideration of Carcinogenic Endpoints

Potential cancer risks were estimated using the ratios of the chemical concentrations and using EPA Region 9 residential and industrial PRGs, in accordance with CAL/EPA's Department of Toxic Substances Control (DTSC) guidance (DTSC 1994). PRGs for carcinogenic chemicals are risk-based chemical concentrations that correspond to a one-in-one-million (10^{-6}) cancer risk using current EPA CSFs and regulatory default "standard" exposure factors in the intake equation (EPA 2000b). EPA's acceptable target cancer risk range is 10^{-6} to 10^{-4}. The EPA directive, "Memorandum Regarding the Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions," states that where cumulative cancer risks to an individual based on the RME for both current and future land use is less than 10^{-4} and no adverse noncancer effects exist, action generally is not warranted unless adverse environmental impacts exist (EPA 1991). The PRGs for carcinogenic chemicals correspond to the lower-bound limit of the EPA acceptable target risk range. The cancer risk for a carcinogenic COPC was calculated using the maximum detected concentration (C_{max}) and PRG for cancer risk (PRG_{ca}) in the following equation:

$$CR_i = (EPC_i \times cPRG_i^{-1}) \times 10^{-6} \qquad \text{(Equation 1)}$$

where

CR_i = Site-related excess lifetime cancer risk for chemical i (unitless)

EPC_i = EPC for chemical i (mg/kg)

$cPRG_i$ = Cancer-based PRG for chemical i (mg/kg)

10^{-6} = Value of the PRG cancer risk (the cancer risk associated with all cancer PRGs is 10^{-6}) (unitless)

A "total" cancer risk estimate was calculated by summing the CR_i values for all COPCs.

Consideration of Noncarcinogenic Endpoints

Potential noncancer hazards were estimated using the ratios of the chemical concentrations and EPA Region 9 PRGs in accordance with DTSC guidance (DTSC 1994). PRGs for noncarcinogenic chemicals are risk-based chemical concentrations that correspond to a noncancer hazard quotient (HQ) of 1 using current EPA RfDs and regulatory default "standard" exposure factors in the intake equation (EPA 2000b). A noncancer HI of 1 or less indicates that little or no potential exists for adverse noncancer health effects (EPA 1989). The noncancer HQs for a noncarcinogenic COPC were calculated using the C_{max} and PRG for non-cancer risk (PRG_{nc}) in the following equation:

Adverse noncancer health effects were estimated for each soil COPC using the following proportion equation:

$$HQ_i = (EPC_i \times nPRG_i^{-1}) \qquad \text{(Equation 2)}$$

where

HQ_i = Site-related hazard quotient for chemical i (unitless)

EPC_i = EPC for chemical i (mg/kg)

$nPRG_i$ = Noncancer based PRG for chemical i (mg/kg)

1 = Value of the PRG hazard quotient (the hazard quotient for all noncancer PRGs is 1; unitless)

The HI or the "total" noncancer estimate was calculated by summing all HQ_i values for all COPCs. The total cancer risk and noncancer HI for the three areas of Site 27 are summarized in Section 2.2.5.6 below.

2.2.5.5 Uncertainty Analysis

There are varying degrees of uncertainty at each stage of the HHRA, arising from assumptions made in the risk assessment and limitations of the data used to calculate risk estimates. Uncertainty and variability are inherent in the identification of COPCs, exposure assessment, toxicity values, and risk characterization. A detailed discussion of the uncertainties associated with the HHRA for Site 27 is presented in Appendix A, Section 12.1.

2.2.5.6 Summary and Conclusion of PRG-Based Human Health Risk Assessment

The HHRA results and conclusions for the three areas analyzed at Site 27 (perimeter of Buildings IA-20 and IA-36; Site 27, excluding the perimeter of Buildings IA-20, and IA-36; and the entire Site 27 area) are presented in Table 2-3 and summarized below. The results of the PRG-based HHRA are summarized in Table A-8 for both current (0 to 0.5 foot bgs) and future (0 to 4 feet bgs) site configurations. Chemical-specific cancer risks and HIs are summarized in Appendix A, Attachment A2. Appendix A, Attachment A3 summarizes the results of a PRG-based HHRA using the maximum detected concentration.

Perimeter of Buildings IA-20 and IA-36

Soil samples at the perimeter of Buildings IA-20 and IA-36 were not collected below 0.5 foot bgs. For this reason, only a current site configuration evaluation was conducted for this area. For both the resident (3×10^{-5}) and the industrial worker (4×10^{-6}), cancer risk estimates for this area are within the EPA's risk range of 10^{-4} to 10^{-6} for cancer effects. The HI of 2 estimated for the resident exceeds EPA's threshold of 1 for noncancer effects. Alpha- and gamma-chlordane accounted for approximately 87 percent of the total HI of 2. All industrial HIs are well below 1.0.

Site 27, Excluding the Perimeter of Buildings IA-20 and IA-36

For Site 27, excluding the perimeter of Buildings IA-20 and IA-36, the current site configuration cancer risk estimates are 6×10^{-6} and 1×10^{-6} for the resident and the industrial worker, respectively. These estimates are within the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HI of 1 for the resident is equivalent to EPA's threshold of 1 for noncarcinogens. Aroclor-1248 and Arocolor-1254 account for approximately 99 percent of the total HI of 1. The estimated HI of 0.08 for the industrial worker is well below EPA's threshold of 1.0.

Assuming future site configuration (subsurface soil samples included), cancer risk estimates are 2×10^{-6} and 4×10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.2 and 0.02 for the resident and the industrial worker receptor, respectively, are well below EPA's threshold of 1.0 for noncarcinogens.

Entire Site 27 Area

For the entire site, the potential cancer risk estimates are 4×10^{-6} and 8×10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.6 and 0.05 for the resident and the industrial worker receptor are well below EPA's threshold of 1.0 for noncarcinogens.

For the entire site, future site configuration (subsurface soil samples included) cancer risk estimates are 3×10^{-6} and 5×10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.4 and 0.03 for the resident and the industrial worker receptor, respectively, are well below EPA's threshold of 1.0 for noncarcinogens.

Results and Conclusions

The results of the HHRA indicate the following.

- At the perimeter of Buildings IA-20 and IA-36, potential adverse human health effects may occur due to exposure to chlordane in surface soil under a residential land-use scenario. No adverse human health effects are indicated under an industrial land-use scenario.
- At Site 27 excluding the perimeter of Buildings IA-20 and IA-36, no potential adverse human health effects were indicated under a residential or industrial land-use scenario.
- At the entire site, no potential adverse human health effects were indicated under a residential or industrial land-use scenario.

The results of the HHRA indicate that under the anticipated industrial land-use scenario, chemicals detected at Site 27 do not pose an unacceptable risk; therefore, remedial action is unnecessary for the protection of human health under the anticipated land-use scenario. However, this focused FS is intended to evaluate remedial actions at the perimeter of Buildings IA-20 and IA-36 that would be needed to support the possibility of unrestricted uses of Site 27 in the future.

The pattern of pesticide detections indicates that pesticides were probably used for surface applications around buildings. The Agency for Toxic Substances and Disease Registry (1993) states that chlordane was used for approximately 40 years as a field crop insecticide and termiticide where both of these uses involved the intentional application of the chemical to soil. Chlordane has been detected in both rural and urban soils in concentrations ranging from less than 1 part per billion (ppb) to 141 parts per million (ppm) (ATSDR 1993). There is no evidence of pesticide disposal or significant off-site pesticide migration at Site 27.

2.2.6 Contaminant Fate and Transport

The major migration pathway for chemical movement of organic COCs from Site 27 is by surface runoff from rainfall events and wind transport of dry surface soil potentially containing contaminants, or possibly by leachate migration. Surface water bodies are not present in the immediate vicinity of Site 27, and surface runoff from rainfall events drains into a storm drain on H Street. The potential for transport of contaminants by groundwater is not considered as viable a migration pathway because the contaminants, which are relatively immobile, are (1) present near the surface, (2) there is no evidence of migration at depth, and (3) the depth to groundwater at the site is relatively deep (estimated at greater than 30 feet bgs).

The most likely transport of the organic COCs in the soil at Site 27 would be from erosion of the soil by surface water or wind. There is no evidence of significant off-site pesticide migration.

2.2.7 Applicable or Relevant and Appropriate Requirements

This section identifies and evaluates potential federal and State of California applicable or relevant and appropriate requirements (ARAR) from the universe of regulations, requirements, and guidance and sets forth the Navy's determinations regarding those potential ARARs for Site 27. This section will address potential chemical-, location-, and action-specific ARARs.

2.2.7.1 Introduction to ARARs

This evaluation includes an initial determination of whether the potential ARARs actually qualify as ARARs and a comparison for stringency between the federal and state regulations to identify the controlling ARARs. The identification of ARARs is an iterative process. The final determination of ARARs will be made by the Navy in the record of decision (ROD), after public review, as part of the response action selection process.

2.2.7.2 Summary of CERCLA and NCP Requirements

Section 121(d) of the CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than federal ARARs.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations similar to the circumstances of the proposed response action and are well suited to the conditions of the site. A requirement must be determined to be both relevant and appropriate in order to be considered an ARAR.

The criteria for determining relevance and appropriateness are listed at Title 40 of the *Code of Federal Regulations* (CFR) (40 CFR 300.400[g][2]) and include the following:

- Purpose of the requirement and the purpose of the CERCLA action;
- Medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site
- Substances regulated by the requirement and the substances found at the CERCLA site
- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site
- Type of place regulated and type of place affected by the release or CERCLA action
- Type and size of structure or facility regulated and type and size of structure or facility affected by the release or contemplated by the CERCLA action
- Any consideration of use or potential use of affected resources in the requirement and use or potential use of the affected resources at the CERCLA site

According to CERCLA ARAR guidance, a requirement may be "applicable" or "relevant and appropriate," but not both. Identification of ARARs must be done on a site-specific basis and involves a two-part analysis: first, a determination of whether a given requirement is applicable; then, if it is not applicable, a determination of whether it is nevertheless both relevant and appropriate. It is important to explain that some regulations may be applicable or, if not applicable, may still be relevant and appropriate. When the analysis determines that a requirement is both relevant and appropriate, compliance with such a requirement must be achieved to the same degree as if it were applicable.

Tables 2-4 through 2-7 present potential federal and state chemical and action-specific ARARs with a determination of ARAR status (that is, applicable, relevant and appropriate, or not an ARAR). For the determination of relevance and appropriateness, the pertinent criteria were examined in light of the criteria previously listed to determine whether the requirements addressed problems or a situation sufficiently similar to the circumstances of the release or remedial action contemplated and whether the requirement was well suited to Site 27.

To qualify as a state ARAR under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a state requirement must meet the following qualifications:

- A state law
- An environmental or facility siting law
- Promulgated (of general applicability and legally enforceable)
- Substantive (not procedural or administrative)
- More stringent than the federal requirement
- Identified in a timely manner
- Consistently applied

To constitute an ARAR, a requirement must be substantive. Therefore, only the substantive provisions of requirements identified as ARARs in this analysis are considered to be ARARs. Permits are considered to be procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations determined to be procedural or nonenvironmental, including permit requirements, are not considered to be ARARs. CERCLA 121(e)(1) states, "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section." The term "on-site" is defined for purposes of this ARAR discussion as, "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action," (40 CFR 300.5).

Nonpromulgated advisories or guidance issued by federal or state governments are not legally binding and do not have the status of ARARs. Such requirements may, however, be useful and are "to be considered" (TBC). TBC requirements (40 CFR 300.400[g][3]) complement ARARs but do not override them. They are useful for guiding decisions regarding cleanup levels or methodologies when regulatory standards are not available.

Pursuant to EPA guidance (EPA 1988), ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific requirements. This classification was developed to aid in this identification of ARARs; however, some ARARs do not fall precisely into one group or another.

Waivers from attaining specific ARARs may be obtained under certain conditions as presented in Section 121(d)(4) of CERCLA. These conditions are as follows:

- The remedial action selected is only part of a total remedial action that will attain the completed ARAR.
- Compliance with the ARAR will result in greater risk to human health and the environment.
- Compliance with the ARAR is technically impractical from an engineering perspective.
- The remedial action selected will attain a standard of performance equivalent to the ARAR through use of another method or approach.
- With respect to a state ARAR, the state has not consistently applied or demonstrated the intention to consistently apply the standard, requirement, criterion, or limitation in similar circumstances for other remedial actions within the state.

Several of these waivers may be relevant to Site 27 as a whole or to specific remedial alternatives and may require further technical evaluation. As the FS and design phases progress, the applicability of these waivers is assessed. A particular ARAR may be waived provided the remedial action is protective of human health and the environment.

As the lead federal agency, the Navy has primary responsibility for identifying federal ARARs at Naval Weapons Station SBD Concord. Identification of potential state ARARs was initiated through Navy requests that the DTSC identify potential state ARARs. At this time, the state has not provided a specific list of potential state ARARs. Nevertheless, the Navy has attempted to identify potential state ARARs for Site 27, as discussed in the following sections.

2.2.7.3 Methodology Description

The process of identifying and evaluating potential federal and state ARARs is described in this subsection.

2.2.7.4 General Identification of Federal and State ARARS

As the lead federal agency, the Navy has primary responsibility for identification of potential ARARs for Naval Weapons Station SBD Concord. In preparing the ARAR analysis, the Navy undertook the following measures, consistent with CERCLA and the NCP:

- Identified federal ARARs for Site 27 based on site-specific information
- Reviewed potential state ARARs identified (no specific ARARs were identified by the state) to determine whether they satisfy CERCLA and NCP criteria that must be met to constitute state ARARs
- As appropriate, evaluated and compared federal ARARs and their state counterparts to determine which state ARARs are more stringent than the federal ARARs or are in addition to the federally required actions
- Reached a conclusion as to which federal and state ARARs are the most stringent and/or "controlling" ARARs for each alternative

2.2.7.5 ARARs of General Applicability

General issues identified during the evaluation of ARARs for Site 27 are discussed in the following subsections.

2.2.7.6 General Approach to Requirements of the Federal Resource Conservation and Recovery Act

RCRA is a federal statute passed in 1976 to meet four goals: the protection of human health and the environment, the reduction of waste, the conservation of energy and natural resources, and the elimination of the generation of hazardous waste as expeditiously as possible. The Hazardous and Solid Waste Amendments (HSWA) significantly expanded the scope of RCRA by adding new corrective action requirements, land-disposal restrictions, and technical requirements. RCRA, as amended, contains several provisions that are potential ARARs for CERCLA sites.

Substantive RCRA requirements are applicable to response actions on CERCLA sites if the waste is a RCRA hazardous waste and either of the following applies:

- The initial treatment, storage, or disposal of the waste occurred after the effective date of the particular RCRA requirement
- The activity at the CERCLA site constitutes generation, treatment, storage, or disposal, as defined by RCRA (EPA 1988)

The preamble to the NCP indicates that state regulations that are components of a federally authorized or delegated state program are generally considered federal requirements and potential federal ARARs for the purposes of ARAR analysis (55 *Federal Register* [FR] 8742). The State of California received approval of its base RCRA hazardous waste management program on 23 July 1992 (57 FR 8742). The State of California set forth "Environmental Health Standards for the Management of Hazardous Waste" in Title 22 of the *California Code of Regulations* (CCR), Division 4.5, which were approved by EPA as a component of the federally authorized State of California Resource Conservation and Recovery Act (RCRA) program.

The regulations of 22 CCR, Division 4.5 are, therefore, a source of potential federal ARARs for CERCLA response actions. The exception is when a state regulation is "broader in scope" or more stringent than the corresponding federal RCRA regulation. In that case, the state regulation is not considered part of the federally authorized program or a potential federal ARAR. Instead, it is a state law requirement and a potential state ARAR.

An EPA notice on July 23, 1992, that approved the State of California RCRA program specifically indicated that the state regulations addressed certain non-RCRA, state-regulated hazardous wastes that fell outside the scope of federal RCRA requirements (57 FR 32726 [1992]). Division 4.5 requirements would be potential state ARARs for such non-RCRA, state-regulated wastes.

2.2.7.7 California Environmental Quality Act

The California Environmental Quality Act (CEQA) is applicable to state actions and not actions of the federal government. Furthermore, EPA and the Navy have determined that the requirements of the National Environmental Policy Act (NEPA) and CEQA are no more stringent than the requirements for environmental review under CERCLA, as amended by SARA. Pursuant to the provisions of CERCLA, the NCP, and other federal environmental impact evaluation requirements, selection of a remedial action with feasible mitigation measures and provisions for public review is designed to ensure that the proposed action provides for short- and long-term protection of the environment and public health. Hence, CERCLA performs the same function as and is substantially parallel to the state requirements under CEQA.

For the reasons set forth above, NEPA and CEQA are not ARARs for CERCLA actions.

2.2.7.8 Chemical-Specific ARARs

Chemical-specific ARARs are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in the establishment of a cleanup level. Many potential ARARs associated with particular response alternatives (such as closure or discharge) can be characterized as action-specific but include numerical values or methodologies to establish them so they fit both categories (chemical- and action-specific). If a chemical has more that one cleanup level, the most stringent level has been identified as an ARAR for this FS. Federal chemical-specific ARARs are presented in Table 2-4 and federal chemical specific ARARs are presented in Table 2-5.

At Site 27, chlordane is the only chemical of concern. The only medium of concern is soil.

The key threshold question for soil ARARs is whether or not the wastes located at Site 27 would be classified as hazardous waste. The soil may be classified as a federal hazardous waste as defined by RCRA and the statute-authorized program, or as non-RCRA, state-regulated hazardous waste. If the soil is determined to be hazardous waste, the appropriate requirements will apply. Any waste generated as a result of the excavation activities will be analyzed to determine if it is a hazardous waste.

The federal RCRA requirements at 40 CFR 261 do not apply in California because the state RCRA program is authorized. The authorized state RCRA requirements are therefore considered potential ARARs. The applicability of RCRA hazardous waste management requirements depends on whether the activity generates a waste; whether the waste is a RCRA hazardous waste; whether the waste initially underwent treatment, storage, or disposal after the date of the particular RCRA requirement; and whether the activity at the site constitutes treatment, storage, or disposal as defined by RCRA. However, RCRA requirements may be relevant and appropriate even if they are not applicable. Examples include activities that are similar to the definition of RCRA treatment, storage, or disposal for waste that is similar to a RCRA hazardous waste.

A determination of whether a waste is a RCRA hazardous waste can be made by comparing the site waste to the definition of RCRA hazardous waste. The RCRA requirements at 22 CCR 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1) and 66261.100 are ARARs because they define RCRA hazardous waste. In particular, a waste can meet the definition of hazardous waste if it has the toxicity characteristic of hazardous waste. This determination is made by using the toxicity characteristic leaching procedure (TCLP). The California regulation at 22 CCR 66261.24(a)(1)(B) lists the maximum concentrations allowable for the TCLP and is a federal ARAR for determining whether the site has hazardous waste. If the site has concentrations exceeding these values, it is determined to be a characteristic RCRA hazardous waste. If site waste is found to contain hazardous waste, it will be managed in accordance with EPA’s contained-in policy.

When state regulations are either broader in scope or more stringent than their federal counterparts, they are considered potential state ARARs. State requirements such as the non-RCRA, state-regulated hazardous waste requirements may be potential state ARARs because they are not within the scope of the federal ARARs (57 FR 60848). The 22 CCR, division 4.5 requirements that are part of the state-approved RCRA program would be potential state ARARs for non-RCRA, state-regulated hazardous wastes.

The site waste characteristics need to be compared to the definition of non-RCRA, state-regulated hazardous waste. The non-RCRA, state-regulated waste definition requirements at 22 CCR 66261.24(a)(2) are potential state ARARs for determining whether other RCRA requirements are potential state ARARs. This section lists the total threshold limit concentrations (TTLCs) and soluble threshold limit concentrations (STLCs). The site waste may be compared to these thresholds to determine whether it meets the characteristics for a non-RCRA, state-regulated hazardous waste.

27 CCR 20210 and 20220 are state definitions for designated waste and nonhazardous waste, respectively. These may be ARARs for soil that meets the definitions. These soil classifications determine state classification and siting requirements for discharging waste to land.

RCRA land disposal restrictions (LDR) at 22 CCR 66268.1(f) are potential federal ARARs for discharging waste to land. This section prohibits the disposal of hazardous waste to land unless (1) it is treated in accordance with the treatment standards of 22 CCR 66268.40 and the underlying hazardous constituents meet the Universal Treatment Standards at 22 CCR 66268.48; (2) it is treated to meet the alternative soil treatment standards set forth at 22 CCR 66268.49; or (3) a treatability variance is obtained under 22 CCR 66268.44. These are potentially applicable federal ARARs because they are part of the state-approved RCRA program. RCRA treatment standards for non-RCRA, state-regulated waste are not potentially applicable federal ARARs, but they may be relevant and appropriate state ARARs.

2.2.7.9 Location-Specific ARARs

Location-specific ARARs restrict actions or limit concentrations of contaminants in certain environmentally sensitive areas. These requirements may limit the type of remedial action that could be implemented and may impose additional constraints on cleanup levels. Examples of environmentally sensitive locations include wetlands, coastal zones, and areas or buildings of archaeological or historical significance. The existence of endangered or threatened species within the area must also be considered. Federal and State of California regulations were reviewed for potential location-specific ARARs.

The Navy has determined that there are no location-specific ARARs for Site 27. Site 27 is not located within a recognized coastal zone or floodplain, there are no wetlands, no buildings of archaeological or historical significance are present, and no threatened or endangered species are present.

2.2.7.10 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These are presented in Tables 2-6 and 2-7 and discussed below. These requirements are triggered by the particular remedial activities conducted at Site 27 and indicate how a selected remedial alternative should be achieved. These action-specific requirements do not in themselves determine the remedial alternative; rather, they indicate how a selected alternative must be achieved.

The alternatives for Site 27 include: (1) no action, (2) land use controls, and (3) demolition and removal of buildings and excavation and incineration of impacted soil.

There are no federally specific ARARs for land use controls. Land use restrictions to ensure that future land use at Site 27 is consistent with its current industrial use would be identified in the Real Estate Summary/Base Mapping System, the BMP and or other Navy Planning documents required for land/facility development.

Alternative 3 involves excavation and incineration of contaminated soils so RCRA is an action-specific ARAR.

The State of California's federally authorized hazardous waste program regulates RCRA as well as non-RCRA hazardous waste. Based on sampling of affected soil at Site 27, it appears as discussed in Section 3.3.3.4 that the materials may meet the definition of RCRA hazardous wastes. The criterion for this determination is presented in 22 CCR, Division 4.5, Chapter 11, Article 3, (22 CCR 66261.10 and 66261.24). If a remedial alternative involves excavation of soil that contains RCRA hazardous waste, then the substantive requirements within 22 CCR, Division 4.5, Chapter 12, Articles 1 and 3 (22 CCR 66262.10 and 66262.34) that apply to generators of hazardous waste are potential ARARs.

Any hazardous waste generated during demolition and hauling or excavation activities is subject to the RCRA requirements identified as chemical-specific ARARs to determine whether such waste would be classified as hazardous. Unless an area of contamination (AOC) is created as discussed below, any hazardous waste accumulated on site must comply with the RCRA requirements set forth at 22 CCR 66262.32. This section permits on-site hazardous waste accumulation for up to 90 days as long as the waste is properly stored and labeled.

If hazardous waste is generated as a result of the demolition of the buildings, the Navy will identify the removal site as an AOC if the site meets the definition of an AOC as stated in the preamble to the NCP (55 FR 8758). With respect to activities conducted within the AOC, the Navy will examine the applicability of the above RCRA regulations in accordance with existing EPA rules and policies regarding the management of remediation wastes in AOCs. As long as the excavated material remains inside the AOC, it is not newly generated and will not be subject to RCRA generator, treatment, or other waste management requirements. Should excavated soil or groundwater from dewatering operations be moved outside of the AOC, the substantive RCRA requirements for managing hazardous waste would become applicable.

For hazardous waste sent off site for disposal at a disposal facility (such as debris), the following RCRA requirements are ARARs: the RCRA pre-transport regulations at 22 CCR 66262.30 (packaging), 66262.31(labeling), 66262.32 (marking) and 66262.33 (placarding); and RCRA manifest requirements at 22 CCR 66262.20, 66262.21, 66252.22, and 66262.23. The regulations implementing the RCRA LDRs, including applicable LDR treatment standards at 22 CCR 66268.7 also are ARARs. Prior to sending any waste off site, the Navy will determine whether the waste is subject to LDRs and will provide the required notices and certifications of 22 CCR 66268.7. In addition, the U.S. Department of Transportation (DOT) hazardous materials regulations at 49 CFR 171 through 172 are also ARARs for transporting hazardous materials on site.

If no hazardous waste is generated as a result of the removal action and therefore RCRA is not applicable, the Navy will analyze RCRA requirements to determine if they are relevant and appropriate. The Navy may determine that certain RCRA regulations are relevant and appropriate because the excavated soil may be similar to a RCRA hazardous waste.

In addition to the above RCRA and DOT requirements, air ARARs relating to excavation activities may be relevant and appropriate to demolition activities. The Bay Area Air Quality Management District (BAAQMD) has promulgated regulations that have been approved by EPA as part of the State Implementation Plan (SIP) and are thus implemented under the authority of Clean Air Act (CAA). BAAQMD regulations 6-301, 6-302, and 6-305, which specify standards for particulates and visible emissions for excavations, are ARARs for the excavation alternative. Regulation 8, Rule 40 is also an ARAR and sets forth standards for maintaining, covering, and stockpiling soil. These limitations are applicable to the proposed remedial alternative involving demolition and off-site disposal because excavation and disposal activities may release particulate matter, contaminants, or dust into the air.

In addition, if the buildings are demolished and they are found to contain asbestos, the Navy will comply with the National Emission Standard Hazardous Air Pollutant (NESHAP) requirements of 40 CFR 61.140-157.

3.0 IDENTIFICATION AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

The objective of this focused FS is to develop and evaluate remedial alternatives for Site 27 that are consistent with CERCLA and the NCP and minimize the potential for human and ecological exposure to affected soil. This section identifies an RAO for contaminated media at Site 27 and presents two GRAs that will satisfy the goal for protecting human health and the environment. This section also identifies and describes three remedial alternatives.

This focused FS does not include a detailed development of GRAs or a detailed screening of remedial process options and remedial alternatives that are typically contained in an FS. This streamlining is consistent with EPA management principals defined in the NCP. The NCP, 40 CFR 300.430(a), provides that "site specific data needs, the evaluation of alternatives, and the documentation of the selected remedy should reflect the scope and complexity of the site problems."

3.1 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals for protecting human health and the environment. Each RAO should specify (1) the contaminant(s) of concern, (2) the exposure route and receptor(s), and (3) an acceptable contaminant concentration or range of concentrations for each exposure pathway. RAOs include both an exposure pathway and a contaminant concentration in a given media because protectiveness may be achieved in two ways: (1) limiting or eliminating the exposure pathway or (2) reducing contaminant concentrations. This FS evaluates remedial alternatives for both approaches. For this FS, only the soil medium has been addressed because groundwater and surface water are not media of concern (see Sections 2.2.4 and 2.2.5).

The RAO developed for Site 27 is based on information from all previous investigations conducted at the site and the PRG-based HHRA (Attachment A1). The RAO developed is consistent with NCP requirements for remedy selection, as detailed in 40 CFR 300.430.

3.1.1 Remedial Action Objective for Unrestricted Land Use

Although current and planned future uses of Site 27 are industrial, with the potential for worker exposures to COCs at the site, this FS conservatively develops an RAO and remedial alternatives that would allow for future unrestricted land use (specifically a residential land use scenario). The results of the HHRA showed that the principal threats to human health under an unrestricted land use scenario come from ingestion, dermal contact, and inhalation of organic compounds of concern in soil adjacent to Buildings IA-20 and IA-36. As discussed above, RAOs can be achieved by eliminating the exposure pathway or reducing the concentration of or eliminating the contaminants of concern. The COCs identified from the HHRA are alpha- and gamma-chlordane found in surface soil directly adjacent to Buildings IA-20 and IA-36.

The RAO for unrestricted land use therefore consists of preventing ingestion of, direct contact with, or inhalation of airborne particulates of alpha- and gamma-chlordane in soil from 0 to 0.5 foot bgs at concentrations greater than the established EPA Region 9 residential level PRG for chlordane (EPA 2000b). The residential PRG for alpha- and gamma-chlordane is 1.6 mg/kg.

3.2 GENERAL RESPONSE ACTIONS

GRAs are responses or remedies that may be implemented at a specific site or group of sites, intended to meet the RAOs. GRAs may be combined to attain the RAOs, as necessary, depending on site conditions and waste characteristics. GRAs may be composed of one or more remedial technology types, for which one or more process options are available (Section 3.3). The GRAs identified for contaminated soil at Site 27 are as follows:

- No action
- Land use controls
- Excavation and disposal off-site

3.2.1 No Action

"No action" implies that no remedial action will be conducted at Site 27. The site is allowed to continue in its current state, and no actions are conducted to remove, isolate, or remediate soil contamination. Natural attenuation is not expected to significantly reduce organic contaminant concentrations over time and monitoring would not be provided to assess changes in site conditions. No access restrictions would be put into place. The NCP requires that "no action" be included among the remedial alternatives evaluated in every FS (40 300.430[e][6]). The no action alternative provides a baseline for comparison to the other remedial alternatives.

3.2.2 Land Use Controls

Land use controls are nonengineering measures, usually legal or physical, for limiting potential exposures to a site or media of concern. Examples of land use controls cited in the NCP include land and resource use and deed restrictions, well drilling prohibitions, building permits, well use advisories, and deed notices. Land use controls also can include access restrictions such as fencing and site monitoring. Land use restrictions would limit the potential for exposure to ingestion, dermal, and inhalation exposure pathways.

3.2.3 Building Demolition and Debris Disposal/Soil Excavation and Incineration Off-Site

This response action involves excavating surface soil affected with COCs above specific cleanup criteria (EPA Region 9 residential PRGs) and treating soil by incineration at an off-site facility. This response action would also involve the demolition of existing Buildings IA-20 and IA-36 to gain access to affected surface soil beneath the building. Asbestos and lead-based paint abatement activities may be required to remove asbestos- or lead-containing materials before building demolition begins, in accordance with State regulations.

3.3 DESCRIPTION OF REMEDIAL ALTERNATIVES

This section develops and describes potential remedial alternatives for contaminated soil. The soil RAO for Site 27 is to prevent exposure to soil concentrations exceeding EPA Region 9 residential PRGs. The remedial alternatives vary in degree of effectiveness, implementability, and cost and represent a range of alternatives as required in the NCP (40 CFR 300.430[e]). This range (as required in the NCP) includes (1) one or more alternatives that involve little or no treatment, but protect human health and the environment primarily by preventing or controlling exposure; (2) an alternative that reduces the toxicity, mobility, or volume of COCs and eliminates the need for long-term monitoring; and (3) a no action alternative.

3.3.1 Alternative 1: No Action

Under Alternative 1, no remedial action will be taken. Contaminated soil will be left at Site 27 "as is," without implementation of any land use control, containment, removal, treatment, or other remedial actions. The no action alternative is retained throughout the FS process as required by the NCP (40 CFR 300.430[e][6]) to provide a comparative baseline against which other alternatives can be evaluated. This alternative is not effective for protecting human health under the unrestricted land use scenario, allowing potential future residents to be exposed to contaminated surface and near surface soils.

3.3.2 Alternative 2: Land use Controls

Land use controls are nonengineering measures, usually legal or physical, for limiting potential exposures to a site or media of concern. Land use restrictions at Site 27 will include development of a land use control remedial design (LUC RD) as part of the final remedial design for the site. The LUC RD will explain how the land use controls are established, documented, maintained and managed.

More specifically, the LUC RD will describe the boundaries of the site, the objectives of the controls, the restrictions, the required frequency for inspections, the entities responsible for carrying out the monitoring and inspection, the methods for certifying compliance and procedures for notifying the state and EPA in the event of a failure to comply with the restriction.

Information in the LUC RD would be incorporated into the Real Estate Summary/Base Mapping System, the BMP and or other Navy Planning documents required for land/facility development. Any potential land use changes, including future construction activities, agricultural, commercial, or residential land use, would be identified and controlled through the "site approval process," during the Navy's project planning and development activities. In addition, future demolition of the buildings would be prohibited, because chemical concentrations beneath the buildings have not been characterized. Encumbrances, constraints, and restrictions identified in the Real Estate Summary/Base Mapping system and Base mater Plan would determine whether the site could be approved for any changes in future land.

Site 27 is located on government property that is not accessible to the general public. These access restrictions reduce the potential that humans, other than personnel working on the site, are exposed to hazardous substances in soil.

Additionally, placement of warning signs on the building that soils are contaminated with chlordane is proposed as part of this alternative to warn potential site workers of the hazard and reduce the potential exposure pathways for human receptors.

3.3.3 Alternative 3: Building Demolition and Debris Disposal/Soil Excavation and Incineration Off-Site

Alternative 3 consists of excavation and incineration of affected soils with concentrations of hazardous compounds that are above specific cleanup criteria (EPA Region 9 residential PRGs). This alternative would also include demolition of Building IA-20, a former chemical and materials testing laboratory, and Building IA-36, a former boiler house. Risks from exposure to contaminated soil by ingestion, dermal contact, or inhalation will be eliminated under this alternative because soil above the PRGs is removed.

The major components of this alternative are as follows:

- Identification of and removal of any asbestos-containing materials in Buildings IA-20 and IA-36, and demolition of the buildings as required by BAAQMD Regulation 11-2

- Identification of and removal of any lead-based paint containing materials in Buildings IA-20 and IA-36, and demolition of the buildings
- Demolition of Buildings IA-20 and IA-36
- Mechanical excavation of contaminated soil, replacement with backfill, using imported material, and surface replacement
- Off-site disposal of debris in appropriate landfills
- Off-site treatment of soil by hazardous waste incineration

Each of these components is described below, followed by a detailed evaluation of this alternative in Section 4.0.

3.3.3.1 Building Demolition

Building IA-20 is a single story building of cinder block construction with a concrete slab foundation measuring approximately 25 feet wide by 45 feet long. Building IA-36 is a single-story building of galvanized steel construction with a concrete slab foundation measuring approximately 20 feet wide by 35 feet long. The requirements of the National Emission Standard for Hazardous Air Pollutants (NESHAP) as found at 40 CFR 61 Part M and as delegated to the State under BAAQMD Regulation 11, Rule 2, require that all buildings be inspected for the presence of ACM prior to demolition. Buildings IA-20 and IA-36 may contain asbestos-containing building materials and lead based-paint because of their age (pre-1978 construction). Therefore, the buildings will be inspected and surveyed for regulated asbestos containing material (RACM) and lead-based paint. If RACMs or lead-based paints are found, they will be removed from the building before demolition activities begin. Any asbestos or lead abatement activities performed will comply with federal and state NESHAP, EPA, and Occupational Safety and Health Administration (OSHA) standards.

3.3.3.2 Excavation and Backfill

This alternative involves the removal and clean backfill of an estimated 330 cubic yards (cy) of contaminated soil from around and beneath Buildings IA-20 and IA-36 (3-foot depth of soil removed over an area of 3,000 square feet). Excavation is proposed beneath the building because soil concentrations have not been evaluated beneath the building, and the standard application of chlordane often includes application beneath structures. Figure 2-3 presents the proposed aerial extent of the excavation and includes the area beneath and surrounding the buildings. Following building demolition, excavation would be performed with standard construction equipment such as bulldozers and front-end loaders.

Engineering control measures would be implemented to prevent airborne dust emissions from Site 27 and control surface erosion.

Concurrent with the excavation activities, this alternative would also include soil characterization sampling and confirmation sampling of soil left in place to be developed as part of the sampling plans in the future remedial design. In addition, air monitoring would be conducted to detect hazardous substance releases and implement appropriate health and safety measures.

Site-specific conditions that may affect the implementability of mechanical excavation are as follows: (1) physical characteristics of the soil being excavated, (2) depth of the excavation, and (3) physical obstructions.

The soil at Site 27 is predominantly native soil with limited areas of soil-fill materials that are relatively heterogeneous and variably compact. The physical characteristics and depth of the soil favor mechanical excavation over other excavation techniques. The potential removal of subsurface boulders and other obstructions is not expected to significantly impede the process. Physical obstructions, such as storm and sanitary sewers, could hamper or prevent excavation in some areas. The need to remove or replace any obstructions, including overhead utilities and buried electrical lines, will be evaluated during the design of the remedial alternative, if it is selected.

3.3.3.3 Off-Site Disposal

Debris and soil will be disposed of at off-site facilities. Soil will be treated at a hazardous waste incineration facility in Port Arthur, Texas. This is based on the assumption that soil at the site will be classified as hazardous and as result will need to meet land disposal requirements (LDR). An explanation of this classification is described below. Building debris will be transported to the Altamont Facility, in Livermore, California. This facility can accept Class II and III waste.

Soil

Chlordane is likely to be classified as RCRA hazardous waste due to its toxicity characteristic. Class I landfills generally accept hazardous waste as defined in 22 CCR, Division 4.5, Chapter 11 if the waste exhibits one of the following four characteristics: ignitability, corrosivity, reactivity, and toxicity. While a toxicity characteristic leaching procedure (TCLP) test has not been conducted on soil samples collected at the site, the maximum expected TCLP concentration of isomers of chlordane in soil at the site can be compared to the TCLP limit of 0.03 mg/L (Cal. Code Regs, Title 22 Section 66261.24) to assess potential classification. This comparison is made by multiplying the TCLP limit by a 10-time dilution factor, which results in a TCLP limit for soil at the site of 0.3 mg/kg. Comparing the site maximum concentration of isomers of chlordane (47 mg/kg) to the TCLP limit of 0.3 mg/kg results in a classification of soil as hazardous (Cal. Code Regs, Title 22 Section 66261.24).

If the soil is classified as hazardous, it would require treatment prior to disposal to meet land disposal requirements (LDR) specified in 22 CCR Division 4.5 Chapter 18. To be disposed of in the land, the concentration of chlordane in soil would need to be at or below 2.6 mg/kg (10 times the Universal Treatment Standards [UTS] for wastes), or it would need to be reduced to that level or by 90 percent, whichever is the higher concentration. The best demonstrated available technology (BDAT) to meet UTS for chlordane waste is hazardous waste incineration.

As discussed in Section 2.2.7.2 and in the responses to comments in Appendix C, the Navy could apply for a waiver to allow for disposal of soil to the land without treatment. However, at this time, the classification of the soil has not been confirmed and it is not known whether a waiver is appropriate or necessary or would be approved. Thus, for purpose of this FS, the Navy has assumed the waste would be classified as RCRA hazardous waste and would be incinerated at the Port Arthur Facility in Texas prior to land disposal.

Demolition Debris

Demolition debris material will go to the Altamont Landfill, which is classified as both a Class II and Class III landfill. Class II generally accepts designated waste as defined in California Water Code Section 13163, as specified in their waste disposal requirements (WDR). Class III landfills accept non-hazardous construction debris.

4.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

The alternatives identified and described in Section 3.0 are evaluated in this section in detail to provide sufficient information for an adequate comparison of the alternatives, selection of an appropriate remedy, and demonstration of satisfaction of the CERCLA remedy selection requirements in the ROD. The following alternatives are evaluated in this section:

- Alternative 1: No Action
- Alternative 2: Land use Controls
- Alternative 3: Building Demolition and Debris Disposal/Soil Excavation and Incineration Off-Site

In this section, the three alternatives are evaluated based on the following nine criteria, as required by Section 300.430(e) of the NCP:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction in toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community Acceptance

These nine criteria are discussed below. A comparative analysis of alternatives is presented in Section 5.0.

4.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

This criterion assesses whether each alternative provides adequate protection of human health and the environment. The overall assessment of protection draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. The protectiveness evaluation focuses on how site risks are reduced or eliminated by each alternative. Risk reductions are associated with how effectively an alternative meets the RAOs. This criterion is considered a threshold criterion and must be met by the selected alternative.

4.2 COMPLIANCE WITH ARARS

This evaluation criterion is used to determine whether each alternative will meet all identified federal and state ARARs or whether justification exists for waiving one or more ARARs. The detailed analysis describes how each alternative will meet ARAR requirements. This criterion is also a threshold criterion that must be met by the selected alternative. Section 2.2.7 summarizes chemical-specific ARARs for Site 27 and identifies potential action-specific ARARs associated with the three remedial alternatives.

4.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Each alternative is evaluated in terms of risk remaining at Site 27 after RAOs have been met. The primary focus of this evaluation is the extent and effectiveness of remedial controls used to manage the risk posed by treatment residuals or untreated wastes. The following criteria were considered:

- Adequacy of remedial controls
- Reliability of remedial controls
- Magnitude of the residual risk

4.4 REDUCTION IN TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

This evaluation criterion addresses the statutory preference for treatment options that permanently and significantly reduce toxicity, mobility, or volume of the contaminants. This preference is satisfied when treatment reduces the principal threats through the following:

- Destruction of toxic contaminants
- Reduction in contaminant mobility
- Reduction of the total mass of toxic contaminants
- Reduction of total volume of contaminated media

4.5 SHORT-TERM EFFECTIVENESS

This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until RAOs are met. Under this criterion, alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The following factors were considered:

- Exposure of the community during implementation
- Exposure of workers during construction
- Environmental impacts
- Time to achieve RAOs

4.6 IMPLEMENTABILITY

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. The following factors were considered:

- Ability to construct the technology
- Reliability of the technology
- Monitoring considerations
- Availability of equipment and specialists
- Ability to obtain concurrence from regulatory agencies

4.7 COST

The cost analysis for each alternative is based on estimates of capital and operation and maintenance (O&M) costs. Capital costs consist of direct and indirect costs. Direct costs include the purchase of equipment, labor, and materials necessary to implement the alternative. Indirect costs include those for engineering, financial, and other services such as testing and monitoring. Annual O&M costs for each alternative include operating labor, maintenance materials and labor, auxiliary materials, and energy.

Per CERCLA guidance (EPA 1988), the accuracy of cost estimates for each alternative in this FS is expected to lie within the range of 50 percent above to 30 percent below the estimate.

4.8 STATE AND COMMUNITY ACCEPTANCE

This criterion evaluates the states and community acceptance of the alternatives presented in the FS. Comments were received on the draft FS from the EPA and the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) and are presented in Appendix C. Written comments on the draft FS have not been received from DTSC or the community.

4.9 ALTERNATIVE 1: NO ACTION

The "no action" alternative implies that no remedial action will be conducted at Site 27 and that the site will be allowed to remain in its current state. The following subsections describe the nine criteria as they apply to this alternative.

4.9.1 Overall Protection of Human Health and the Environment – Alternative 1

Assuming the current and planned future uses of Site 27 remain industrial, risks to human health would remain within acceptable limits. However, the "no action" alternative is not protective of human health or the environment under the unrestricted land use scenario because this alternative does nothing to prevent unrestricted use or address contaminants in soil posing a potential human health risk. Because no remedial action will be taken, contaminated soil is left "as is." This alternative will not eliminate, reduce, or control the potential human health risk presented by contaminated soil at the site.

4.9.2 Compliance with ARARs – Alternative 1

No ARARs apply to this alternative.

4.9.3 Long-term Effectiveness and Permanence – Alternative 1

If the future use of Site 27 changes to unrestricted use, risks to human health will be unacceptable because of the presence of alpha-chlordane and gamma-chlordane in surface soil adjacent to Buildings IA-20 and IA-36. Thus, Alternative 1 does not provide long-term effectiveness and permanence.

4.9.4 Reduction of Toxicity, Mobility, or Volume Through Treatment – Alternative 1

The mobility, toxicity, and volume of hazardous substances at Site 27 will not be reduced under Alternative 1 because the contaminated soil will not be treated, contained, or managed in any way.

4.9.5 Short-term Effectiveness – Alternative 1

Because this alternative does not involve any action, there will be no risks to the community or workers during implementation. No adverse environmental impacts will result from the construction and implementation of this alternative because no remedial action will be taken. The RAO for soil will not be achieved under the unrestricted land use scenario because it does not protect future residents from potentially harmful levels of chlordane in soil. The no action alternative is therefore not considered effective in the short term.

4.9.6 Implementability – Alternative 1

Implementability includes the technical and administrative feasibility and availability of required resources. No construction or administrative activities will be required to implement this alternative; therefore, the alternative is technically feasible. This alternative is easily implemented because no action will be conducted and additional resources are not required.

4.9.7 Cost – Alternative 1

No capital or O&M costs are associated with this alternative.

4.9.8 State Acceptance – Alternative 1

Alternative 1 is unacceptable to the state and EPA because risks under unrestricted reuse are not acceptable and insufficient data are available beneath the site building to characterize risk (EPA 2002).

4.9.9 Community Acceptance – Alternative 1

Alternative 1 is unlikely to be acceptable to the community for the same reasons as specified by the state and EPA above.

4.10 ALTERNATIVE 2: LAND USE CONTROLS

Land use controls are nonengineering measures for limiting potential exposures within a site or media of concern. The following subsections describe the nine criteria as they apply to this alternative.

4.10.1 Overall Protection of Human Health and the Environment – Alternative 2

The RAO is concerned with preventing exposure to contaminated soil by future residents. Alternative 2 protects human health and the environment by restricting access to affected soil at Site 27 by residents, children in school or day-care centers, or other permanent occupants. Land use in the area around Buildings IA-20 and IA-36 will be restricted through notations incorporated into the Real Estate Summary/Base Mapping System, the BMP and or other Navy Planning documents required for land/facility development. The LUC RD will be prepared as part of the final remedial design, and will ensure the implementation of the land use restrictions. This alternative will reduce potential human health risks presented by contaminated soil by limiting exposure to contaminants to acceptable levels.

4.10.2 Compliance with ARARs – Alternative 2

No chemical- or action-specific ARARs are considered applicable to this alternative because affected soil will not be disturbed or handled. No location specific ARARs have been identified.

4.10.3 Long-term Effectiveness and Permanence – Alternative 2

The factors evaluated under long-term effectiveness and permanence include the magnitude of residual risks and adequacy and reliability of controls. Each of these factors is assessed below for Alternative 2.

4.10.3.1 Magnitude of Residual Risks

Risks will be reduced to within acceptable risk ranges because the use of Site 27 will be restricted to industrial workers only.

4.10.3.2 Adequacy and Reliability of Controls

Because contaminated soil will not be removed from the site, the long-term adequacy and reliability of controls will depend on the ability of the Navy to enforce land-use restrictions. The Navy will prepare and follow the requirements of the land use control remedial design (LUC RD) as part of the final remedial design for the site, which will ensure the implementation of land use restrictions, as incorporated into the Real Estate Summary/Base Mapping System, the Base Master Plan (BMP) and or other Navy Planning documents required for land/facility development (see also Section 3.3.2). This includes noting the condition of the site annually for an estimated period of 30 years (EPA 2000a). Proper implementation of the LUC RD would adequately control exposure to contaminated soil and would be reliable over the long term.

Overall Alternative 2 is considered to be reasonably effective in the long-term.

4.10.4 Reduction of Toxicity, Mobility, or Volume – Alternative 2

Land use controls do not reduce the mobility, toxicity, or volume of hazardous substances.

4.10.5 Short-Term Effectiveness – Alternative 2

This alternative will not present any new health risks to the community or workers during implementation. The surrounding community is far removed from Site 27 and is not likely to face any short- or long-term risks from the site. The preparation of the proposed LUC RD to insure land use restrictions and placement of signs could occur within a three-month time frame; however, long term monitoring is required to monitor the condition of the site.

The land use control alternative is therefore considered highly effective in the short term.

4.10.6 Implementability – Alternative 2

Implementability includes the technical and administrative feasibility and availability of required resources. No construction activity would be required to implement this alternative; controlled access should be strictly implemented to achieve the effectiveness of this alternative; therefore, the alternative is technically feasible. This alternative is administrative in nature and will involve planning and organization to implement over the short and long term. Substantial coordination and cooperation will be needed between the Navy, as the landowner, and the regulatory agencies. Alternative 2 will require a modest amount of resources over the long term, and overall, it is not considered difficult to implement.

4.10.7 Cost – Alternative 2

This alternative is relatively inexpensive to implement. The initial cost of implementing the land use controls through the Real Estate Summary/Base Mapping System and the BMP is relatively low, and future costs to monitor and enforce land use controls are considered modest. Total estimated cost for this alternative is $121,000, as further detailed within Appendix B.

4.10.8 State Acceptance – Alternative 2

The state did not have any specific comments regarding Alternative 2. Alternative 2 is acceptable to EPA if the Navy is able to demonstrate an effective method of controls to restrict access to soils below the building and/or demolition of the building (EPA 2002).

4.10.9 Community Acceptance – Alternative 2

The Navy has not received specific comments from the community on Alternative 2.

4.11 ALTERNATIVE 3: BUILDING DEMOLITION AND DEBRIS DISPOSAL/SOIL EXCAVATION AND INCINERATION OFF-SITE

This alternative consists of excavation and incineration of all affected soil. It also consists of demolition of Buildings IA-20 and IA-36 and disposal of debris in a landfill. As discussed in Section 3.3.3, soil is assumed to be classified as RCRA hazardous waste and will be incinerated at the Port Arthur Facility in Texas. This alternative would be implemented to address the RAO. The major components of this alternative are as follows:

- Identification and removal of any asbestos containing materials from the existing buildings
- Identification and removal of any lead-based paint materials from the existing buildings
- Demolition of Buildings IA-20 and IA-36
- Excavation of contaminated soil
- Off-site disposal of debris in appropriate landfill(s)
- Off-site treatment of soil by incineration followed by disposal of soil
- Confirmation soil sampling
- Backfill with clean imported materials

The following subsections describe the nine criteria as they apply to this alternative.

4.11.1 Overall Protection of Human Health and the Environment – Alternative 3

Alternative 3 will protect human health and the environment because it will involve excavation and removal of contaminated soil from affected areas, thereby eliminating the potential for direct contact with, ingestion of, or inhalation of contaminated soil by humans. Movement of quantities of affected soil will create some short-term risks to the community, site workers, and the environment; however, these will be minimized by compliance with ARARs during implementation of this alternative.

4.11.2 Compliance with ARARs – Alternative 3

Alternative 3 can be designed to meet all chemical- and action-specific ARARs. Excavation and disposal activities may trigger a variety of hazardous waste requirements. The Navy will analyze samples of the excavated soils in accordance with hazardous waste identification regulations set forth at 22 CCR, Division 4.5, Chapters 11 and 14, to determine whether the soil exhibits state or federal hazardous waste characteristics. If the soil qualifies as a hazardous waste, as this FS assumes, it will be managed, stored, and transported in accordance with the substantive federal requirements set forth at 49 CFR 171, and 49 USC 5101 through 5127 as well as the State requirements at 22 CCR, Sections 66262.20 through 66262.23 and Sections 66262.30 through 66262.34 (see also Tables 2-6 and 2-7). The landfill operator will treat excavated soil by incineration, as appropriate, to comply with LDRs set forth at 22 CCR 66268.7.

The substantive requirements in BAAQMD Regulation 6 are considered applicable to Alternative 3. Specifically, Regulations 6-301, 6-302, and 6-305, which contain particulates and visible emissions standards, will be applicable to limit dust and particulate emissions during excavation and removal activities as will the covering and stockpiling requirements found within BAAQMD Regulation 8

Rule 40. Dust control will likely include the use of water, palliatives, appropriate covering for stockpiled soil, modifications of operations, or other engineering means acceptable to the Navy and regulatory agencies. Furthermore, if Buildings IA-20 and IA-36 are found to contain asbestos construction materials or lead-based paint, removal and off-site disposal of asbestos and lead materials will occur prior to building demolition.

4.11.3 Long-term Effectiveness and Permanence – Alternative 3

The factors evaluated under long-term effectiveness and permanence include the magnitude of residual risks and adequacy and reliability of controls. Each of these factors is assessed below for Alternative 3.

4.11.3.1 Magnitude of Residual Risks

Residual risks will be permanently reduced to within acceptable levels that are protective of human health and the environment by removing all affected soil with concentrations exceeding the EPA Region 9 residential PRG for soil.

4.11.3.2 Adequacy and Reliability of Controls

Excavation and off-site treatment of soil by incineration is a proven and reliable technology that would effectively remove contaminated soil from the site and thus permanently reduce the possibility of human exposure to affected materials at Site 27. Technology performance specifications, long-term management, site monitoring, O&M requirements, and technical component replacement are not required because this alternative will involve removal of contaminated soil. Therefore, Alternative 3 is considered highly effective over the long term.

4.11.4 Reduction of Toxicity, Mobility, or Volume Through Treatment – Alternative 3

Alternative 3 will reduce the toxicity, mobility, or volume of hazardous substances by excavation and incineration of the pesticide containing soil. Therefore, the CERCLA preference for treatment, as a principal element of the 45remedy, will be satisfied by Alternative 3.

4.11.5 Short-term Effectiveness – Alternative 3

An evaluation of each of the four factors considered when assessing the short-term effectiveness of an alternative. Each of these factors is assessed in the following paragraphs for Alternative 3.

4.11.5.1 Protection of the Community

The surrounding community is far removed from Site 27 and is not likely to face any short-term risks during building demolition, excavation, and removal activities. However, measures will be taken during demolition, excavation, staging, and loading of contaminated soil (excavation activities) to reduce and control short-term risks.

For example, dust suppression measures will be used to reduce the generation of fugitive dusts. Furthermore, site access will be controlled to reduce the potential for direct contact with contaminated soil. An air-monitoring plan will be developed; it will establish specific boundaries of work areas and traffic routes. Strategic locations along these boundaries will be monitored for airborne emissions to determine that short-term health levels are achieved throughout the remedial actions. The local community may also be faced with additional short-term impacts resulting from increased truck traffic during building demolition, excavation, and backfilling activities.

4.11.5.2 Protection of Workers

Worker safety considerations associated with implementation of Alternative 3 can be grouped in two categories: (1) general construction site hazards and (2) potential chemical exposure hazards. General site hazards include the following:

- Heavy equipment hazards
- Occupational noise exposure
- Potential slip, trip, or fall hazards
- Potential for contact with underground or overhead mechanical and electrical hazards or utility lines
- Airborne dust hazards

Exposure to general site hazards can be reduced by providing (1) appropriate safety equipment to minimize noise and dust exposure and (2) awareness training to orient personnel with the physical hazards at the site.

Potential chemical hazards include inhalation of, absorption of, ingestion of, and contact with hazardous substances in building materials and contaminated soil. On-site remedial workers will wear Level D protection during soil excavation activities. Level C or greater levels of protection may be necessary to conduct asbestos abatement and will be supplemented with continuous baseline and personal air monitoring. The specific protection worn will be determined by the level of dermal and inhalation protection necessary. Air monitoring will be conducted to assist in determining the required level of protection. The level of protection will be upgraded if high contaminant concentrations are detected during excavation of soil at Site 27.

4.11.5.3 Environmental Impact

Excavation activities will not result in increased impact on the environment. Dust suppression measures and engineering controls will minimize any impacts. Air monitoring will assist in determining whether dust control measures are effective to limit environmental impacts. In addition, surface drainage controls and appropriate equipment decontamination procedures will be used to prevent transport of contaminated soil to uncontaminated areas at Site 27.

4.11.5.4 Time Required for Remedial Action

Approximately 3 to 4 months will be required to complete all remedial activities associated with Alternative 3. The length of time required to excavate and remove contaminated soil may be affected by the following factors:

1. The time required to characterize samples of the contaminated soil.
2. Additional volumes of contaminated soil encountered during excavation.
3. The number of unanticipated obstructions during excavation.
4. Suitable weather conditions.

Based on the four criteria above, Alternative 3 is considered to have an overall moderate level of short-term effectiveness.

4.11.6 Implementability – Alternative 3

The technical and administrative feasibility and availability of required resources to implement Alternative 3 are discussed below.

4.11.6.1 Technical Feasibility

Alternative 3 is considered to have medium technical complexity. This alternative will use standard construction methods and equipment modified for use at hazardous waste sites. Some technical difficulties and added regulatory constraints may be encountered with building demolition activities. The shallow soil excavations do not pose a technical concern. After site restoration and backfilling, no long-term O&M activities will be necessary.

4.11.6.2 Administrative Feasibility

The alternative is administratively feasible. Coordination with multiple regulatory agencies will be necessary to comply with action-specific ARARs.

4.11.6.3 Availability of Required Resources

Overall, Alternative 3 is considered to be implementable because it is both technically and administratively feasible. However, the waste will need to be incinerated at an off-site facility outside of California.

4.11.7 Cost – Alternative 3

The overall cost of this alternative is considered high because it includes capital costs associated with asbestos abatement, lead based paint abatement, building demolition, and soil excavation and incineration. No O&M costs are associated with this alternative. Total estimated cost to complete this alternative is $682,000 (see Appendix B).

4.11.8 State Acceptance – Alternative 3

The state did not have any specific comments regarding Alternative 3. EPA, in their comments on the draft FS (Appendix C), recommended that the Navy could apply for a treatability variance for soils to allow for disposal of slightly contaminated soil to the land without meeting the LDRs.

4.11.9 Community Acceptance – Alternative 3

The Navy has not received comments from the community regarding Alternative 3.

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section analyzes the advantages and disadvantages of each of the three alternatives evaluated in Section 4.0. Identification of a preferred alternative will be made within the future proposed plan to be developed following this FS.

For an alternative to be eligible for selection as a preferred alternative, it must meet two CERCLA-recognized threshold criteria: overall protection of human health and the environment and compliance with ARARs. After the comparison with threshold criteria, a comparative analysis of remedial alternatives is conducted based on five CERCLA-recognized "primary balancing criteria" that identify and weigh the major tradeoffs among alternatives. The last two criteria, state and community acceptance, will be addressed in the ROD after final comments from the community and the agencies are received on the FS and the future proposed plan. The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each alternative and thereby provide a sound basis for remedy selection that is consistent with the NCP. The results of the comparative analyses are presented in Section 5.4 and summarized in Table 5-1.

5.1 THRESHOLD CRITERIA

Alternative 1 does not meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs for the unrestricted land use scenario. The no action alternative will result in site conditions that are controlled only by current land use practices. Without additional controls, land use could change, giving rise to the unacceptable exposure of contaminants to human (residential) receptors. Alternative 1 does not address potential unacceptable exposures to human receptors.

Because Alternative 1 does not meet the threshold criteria for the site, this alternative is not eligible for selection. However, according to the NCP, the no action alternative provides a basis for comparison against other alternatives.

As discussed in Section 4.0, Alternatives 2 and 3 meet the threshold criteria. Both alternatives provide protection of human health; however, Alternative 3 provides a more permanent solution because Alternative 2 is dependent on long-term maintenance activities to ensure that remedial measures remain effective. Alternative 1 has no ARARs to meet. Alternatives 2 and 3 can be implemented to meet all ARARs.

5.2 BALANCING CRITERIA

The following five criteria are used for comparative analysis of remedial alternatives and are discussed in the following sections:

- Long-Term Effectiveness and Permanence
- Reduction in Toxicity, Mobility, and Volume
- Short-Term Effectiveness
- Implementability
- Cost

5.2.1 Long-term Effectiveness and Permanence

Alternative 1 provides no long-term effectiveness since site conditions will be unpredictable and uncontrolled; and may result in future exposure to human receptors. Future use of Site 27 is likely to remain industrial. However, the long-term effectiveness of Alternative 2 depends on the long-term enforcement and monitoring of the land use controls. Alternative 3 provides the best overall long-term effectiveness because it is a permanent solution that presents no residual risks to human receptors.

5.2.2 Reduction in Toxicity, Mobility, and Volume Through Treatment

Alternative 3 reduces the toxicity, mobility, and volume at the site as the chlordane-contaminated soil will be removed and treated. Because Alternatives 1 and 2 do not provide any active remediation, these alternatives do not meet this criterion.

5.2.3 Short-term Effectiveness

Alternative 1 is considered to be least effective in the short term because no remedial action will be taken and the RAO will not be met under this alternative. Alternative 2 is considered to be most effective in the short term because it can be implemented in a relatively short timeframe, it will achieve the RAOs in the short term, and will not expose the community or workers to and increased risks during implementation. Alternative 3 is considered slightly less effective in the short term because of the risk of exposing the community or workers to risks during implementation.

5.2.4 Implementability

Because no action will be taken under Alternative 1, this alternative is the easiest to implement. Both Alternative 2 and 3 can be implemented. Alternative 3 may be slightly more difficult to implement than Alternative 2 because the buildings on-site will need to be demolished and the waste will need to be incinerated. Alternative 2 will require implementation of administrative actions over the period of the institutional controls.

5.2.5 Cost

Table 5-2 summarizes alternative costs. There is no cost associated with Alternative 1. The total costs for Alternative 2 have been estimated at $121,000 and the total cost for Alternative 3 are estimated at $682,000. Thus, the costs are significantly higher for Alternative 3 than Alternative 2.

5.3 MODIFYING CRITERIA

State and community acceptance criteria are used for comparative analysis of remedial alternatives as CERCLA-recognized modifying criteria. Alternative 1 is not acceptable to the state or community. EPA has indicated that both Alternatives 2 and 3 are acceptable (EPA 2002). The Navy has not received comments from the state and community regarding the acceptability of Alternatives 2 and 3.

5.4 RESULTS OF COMPARATIVE ANALYSIS

Results of the comparative analysis are summarized in Table 5-1 and indicate that Alternative 2 and Alternative 3 are similarly ranked.

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TABLES

TABLE 2-1
ALL CHEMICALS DETECTED IN SOIL
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

		Pesticides								TPH			PCBs		VOC				SVOA*											
Sample Location	**Depth (feet bgs)**	**Alpha-chlordane (mg/kg)**	**Gamma-chlordane (mg/kg)**	**DDD (mg/kg)**	**DDE (mg/kg)**	**DDT (mg/kg)**	**Dieldrin (mg/kg)**	**Endosul-fan (mg/kg)**	**Heptachlor Epoxide (mg/kg)**	**Diesel (mg/kg)**	**Motor Oil (mg/kg)**	**Gasoline (mg/kg)**	**Aroclor 1254 (mg/kg)**	**Aroclor 1248 (mg/kg)**	**2-Butanone (mg/kg)**	**Acetone (mg/kg)**	**Carbon Disulfide (mg/kg)**	**Toluene (mg/kg)**	**1-Nitroan-iline (mg/kg)**	**Benzo(a) anthracene (mg/kg)**	**Benzo(a) pyrene (mg/kg)**	**Benzo(b) fluoranthene (mg/kg)**	**Benzo(g,h,i) pyrelene (mg/kg)**	**Benzo(k) fluoranthene (mg/kg)**	**Chrysene (mg/kg)**	**Fluoran-thene (mg/kg)**	**Indeno(1,2,3-cd) pyrene (mg/kg)**	**Pentach-lorophenol (mg/kg)**	**Phenol (mg/kg)**	**Pyrene (mg/kg)**
Residential PRG		1.6	1.6	2.4	1.7	1.7	0.03	370	None	None	None	None	0.22	0.22	None	1,600	360	520	None	0.62	0.062	0.62	2,300	0.61	62	2,300	0.62	3	37,000	2,300
Remedial Investigation Soil Samples																														
MTLSB010	0-0.5	--	--	--	--	--	--	--	--	--	700	NA	**0.45**	**0.39**	NA	NA	NA	NA	--	0.028	0.023	0.018	0.026	0.019	0.03	--	--	--	--	--
MTLSB011	0-0.5	--	--	--	--	--	--	--	--	--	38	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB012	0-0.5	0.045	0.035	0.06	0.031	--	--	--	--	--	77	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB013	0-0.5	0.049	0.021	--	--	0.014	--	0.024	--	--	40	NA	**1**	**0.5**	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB014	0-0.5	**24**	**23**	--	--	--	--	--	--	--	630	NA	--	--	NA	NA	NA	NA	0.15	--	--	--	--	--	0.024	--	--	--	--	--
MTLSB015	0-0.5	0.1	0.1	0.05	--	--	--	--	--	2,700	7,400	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB016	0-0.5	0.001	0.001	--	--	--	--	--	--	--	190	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	0.028	--	--	--	0.021
MTLSB017	0-0.5	**4.3**	**4.3**	2.0	--	--	--	--	--	--	470	NA	--	--	NA	NA	NA	NA	--	--	--	0.024	0.035	ND	0.033	0.038	0.019	0.078	--	0.031
MTLSB018[a]	0-0.5	**13**	**12.0**	**8.2**	--	--	--	--	--	540	12,000	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB019[a]	0-0.5	0.015	0.018	--	--	--	--	--	--	29	320	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB020	0-0.5	0.009	0.003	--	--	--	--	--	--	--	21	NA	**0.28**	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB021	0-0.5	--	0.002	--	--	--	--	--	--	--	39	NA	--	0.036	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB022	0-0.5	--	--	--	--	--	--	--	--	--	29	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB023	0-0.5	--	--	--	--	--	--	--	--	--	63	NA	--	--	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	0.38	--
	3-4	--	--	--	--	--	--	--	--	--	25	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB024	0-0.5	0.006	--	--	--	--	0.006	--	--	--	43	NA	0.15	0.11	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
	3-4	--	--	--	--	--	--	--	--	--	--	NA	--	0.049	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTLSB025	0-0.5	0.007	--	--	--	--	--	--	--	--	34	NA	0.12	0.18	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	0.27	--
	3-4	--	--	--	--	--	--	--	--	--	19	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Site Investigation Soil Samples[b]																														
MTL-01-CSS	0-0.5	0.004	--	--	0.006	0.009	0.005	--	0.004	5.12	NA	0.348	--	--	--	0.11	0.002	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-02-CSS	0-0.5	0.005	--	--	0.004	0.005	0.005	--	0.004	11.9	NA	0.277	--	--	--	0.078	--	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-03-CSS	0-0.5	0.109	0.107	--	--	--	--	--	--	--	NA	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-04-CSS	2.5-3.0	0.013	0.013	--	--	0.007	--	--	--	--	NA	--	--	--	0.003	--	--	0.004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-05-CSS	0-0.5	0.723	0.821	0.311	0.099	0.395	**0.073**	--	--	--	NA	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-06-CSS	2.5-3.0	0.065	0.071	0.024	0.008	0.040	--	--	--	--	NA	--	--	--	0.003	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-07-CSS	0-0.5	0.0135	0.0101	--	--	--	--	--	--	--	NA	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-08-CSS	2.5-3.0	--	--	--	--	--	--	--	--	--	NA	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-09-CSS	0-0.5	0.25	0.277	0.19	0.103	0.416	0.004	--	--	4.51	NA	--	--	--	--	--	0.004	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-10-CSS	2.5-3.0	0.0277	0.0327	0.01	--	0.018	0.004	--	--	3.68	NA	--	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-11-CSS	0-0.5	0.0693	0.0656	0.02	0.014	0.053	0.004	--	--	--	NA	--	--	--	0.003	--	--	0.002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTL-12-CSS	2.5-3.0	0.0316	0.0291	0.01	0.014	0.055	--	--	--	--	NA	--	--	--	0.004	--	--	0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

-- Not detected
bgs Below ground surface
BOLD Concentration exceeds PRG
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethene
DDT Dichlorodiphenyltrichloroethane
mg/kg Milligram per kilogram
NA Not analyzed
PCB Polychlorinated bipenyl
PRG Preliminary remediation goal
RI Remedial investigation

SI Site investigation
SVOC Semi-volatile organic compound
TPH Total petrol RI soil sample location
VOC Volatile org SI soil sample
MTLSBXXX
MTL-XX-CSS
* In addition to the samples listed in this table, 2 SVOC samples were analyzed during the RI using low-level detection limit methods in surface samples MTLSB010 and MTLSB016; all sample results indicated no detections.
a Soil at MTLSB018 and MTLSB019 was removed, and the excavation was backfilled with clean soil as part of the UST investigation (KTW & Associates 1997)
b Freon 113 was analyzed in all SI soil samples and was not detected

TABLE 2-2
GEOTECHNICAL TESTING RESULTS
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Sample Location	Sample Depth (feet bgs)	Grain Size	Permeability (cm/sec)	Porosity (%)	Density (lb/ft^3)	Specific Gravity	Moisture (%)
MTLSB023	3.0 to 4.0	Sandy clay	2.00E-05	39.74	105.3	2.80	17.6
MTLSB024	3.0 to 4.0	Sandy clay	6.00E-08	38.69	104.4	2.73	20.7
MTLSB025	3.0 to 4.0	Sandy clay	2.00E-06	40.20	100.4	2.69	20.3

Notes:
BGS Below ground surface
cm/sec Centimeters per second
% Percent
lb/ft^3 Pound per cubic foot

TABLE 2-3
RESULTS OF PRG-BASED HUMAN HEALTH RISK ASSESSMENT
REASONABLE MAXIMUM EXPOSURE SCENARIO
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

	Residential		Industrial	
Current Site Conditions[a]	**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
Perimeter of Buildings IA-20 and IA-36[b]	3.E-05	**2**[c]	4.E-06	0.08
Site 27 Excluding the Buildings IA-20 and IA-36	6.E-06	1[d]	1.E-06	0.08
Entire Site 27 Area	4.E-06	0.6	8.E-07	0.05
Future Site Conditions[e]				
Perimeter of Buildings IA-20 and IA-36[b]	- -[f]	- -	- -	- -
Site 27 Excluding the Buildings IA-20 and IA-36	2.E-06	0.2	4.E-07	0.02
Entire Site 27 Area	2.5.E-06	0.4	5.E-07	0.03

Notes:

For all evaluations of Site 27 composite soil samples were excluded from evaluation (Appendix A, Section A1.5.2).

a Current site conditions were evaluated using soil data collected from 0 to 0.5 foot below ground surface.

b Soil samples MTLSB014, MTLSB017, MTLSB018, and MTLSB019 were used to evaluate chemical impacts at Buildings IA-20 and IA-36.

c Alpha- and gamma-chlordane account for approximately 87 percent of the total hazard index of 2 .

d Aroclor 1248 and 1254 account for approximately 99 percent of the total hazard index of 1.

e Future site conditions were evaluated using soil data collected at all available depths (that is, down to 4 feet below ground surface).

f Soil samples were not collected beyond 0.5 foot below ground surface at Buildings IA-20 and IA-36. For this reason, impacts associated with future site conditions could not be quantified.

PRG Preliminary remediation goal

TABLE 2-4
POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARS
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Requirement	Prerequisite	Citation	ARAR Determination	Comments
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-699[I].)				
Definition of RCRA hazardous waste	Waste	CCR Title 22, Division 4.5, Chapter 14, §§§ 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1) and 66261.100	Applicable	The requirements of 22 CCR, Division 4.5, Chapter 14 are applicable for determining whether excavated material contains hazardous waste. These requirements may be relevant and appropriate to excavated material that is similar or identical to RCRA hazardous waste or non-RCRA hazardous waste
LDRs prohibiting disposal of hazardous waste unless treatment standards are met	Hazardous waste land disposal	CCR Title 22, § 66268.1(f)	Applicable	These requirements are applicable if disposal of hazardous waste is to occur on land.

Notes:

ARAR	Applicable or relevant and appropriate requirement
CCR	California Code of Regulations
LDR	Land disposal restriction
RCRA	Resource Conservation and Recovery Act
USC	U.S. Code

TABLE 2-5
POTENTIAL STATE CHEMICAL-SPECIFIC ARARS
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Requirement	Prerequisite	Citation	ARAR Determination	Comments
Cal-EPA Department of Toxic Substances Control				
Definition of "non-RCRA hazardous waste"	Waste	CCR Title 22, Division 4.5, Chapter 14, §§66261.22(a)(3) and (4), 66261.24(a)(2)-(a))8), 66261.101 66261.3(a)(2)(C) or 66261.3(a)(2)(F)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste
State and Regional Water Quality Control Boards				
Definitions of designated waste and nonhazardous waste	Waste	CCR Title 27, §§ 20210, 20220	Applicable	Potential ARARs for classifying waste and determining ARAR status of other requirements

Notes:
ARAR Applicable or relevant and appropriate requirement
Cal-EPA California Environmental Protection Agency
CCR California Code of Regulations
RCRA Resource Conservation and Recovery Act

TABLE 2-6
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Resource Conservation and Recovery Act (42 USC, Chapter 82, §§ 6901-699[I].)					
Activities relating to the handling of potentially hazardous soil or water	Criteria are provided for determining whether a solid or liquid waste is a RCRA or non-RCRA hazardous waste.	Generator of waste	Hazardous Waste Regulations, 22 CCR, Division 4.5, Chapter 11, Article 3, § 66261.24)	Applicable	Applicable for determining whether excavated soil from the Site must be managed as a hazardous waste for Alternative 3.
Hazardous waste accumulation	On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers or tanks, on drip pads, inside buildings, is labeled and dated, etc.	Accumulation of hazardous waste	22 CCR, Division 4.5, Chapter 12, Article 3, § 66262.34	Applicable	These requirements are applicable to Alternative 3 if hazardous waste is generated and accumulated on-site before transport.
Pretransport requirements	Hazardous waste must be packaged in accordance with DOT regulations prior to transporting.	Any operation where hazardous waste is generated	22 CCR, § 66262.30	Applicable	These requirements are applicable to Alternative 3 if hazardous waste is to be transported.
	Hazardous waste must be labeled in accordance with DOT regulations prior to transporting.	Any operation where hazardous waste is generated	22 CCR, § 66262.31	Applicable	These requirements are applicable to Alternative 3 if hazardous waste is to be transported.
Pretransport requirements	Requirements are provided for marking hazardous waste prior to transporting it.	Any operation where hazardous waste is generated	22 CCR, § 66262.32	Applicable	These requirements are applicable to Alternative 3 if hazardous waste is to be transported.
	A generator must ensure that the transport vehicle is correctly placarded prior to transport of hazardous waste.	Any operation where hazardous waste is generated	22 CCR, § 66262.33	Applicable	These requirements are applicable to Alternative 3 if hazardous waste is to be transported.

TABLE 2-6 (continued)
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs
SITE 29 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Transportation of hazardous materials	A manifest for transport of hazardous waste off site must be prepared.	Any operation where hazardous waste is transported	22 CCR, Division 4.5, Chapter 12 § 66262.20 - 66262.23	Applicable	These requirements are applicable to Alternative 3 if hazardous waste is to be transported
Placement of waste in land disposal units	Generators of hazardous waste are required to determine if waste has to be treated before disposal of the waste on land. Generators must notify the treatment facility if a waste is subject to LDRs and does not meet applicable treatment standards. If the waste meets treatment standards, generators must sign a certification.	Any operation where land disposal of waste is conducted	22 CCR, Division 4.5, Chapter 18 § 66268.7	Applicable	These requirements are applicable to Alternative 3 if disposal of hazardous waste is to be conducted.
Federal Hazardous Materials Transportation Law (49 USC §§ 5101-5127)					
Transportation of hazardous material	Requirements are set forth for transporting hazardous waste, including representations that containers are safe, prohibitions on altering labels, marking requirements, labeling requirements, and placarding requirements.	Interstate carriers transporting hazardous waste and substances by motor vehicle Transportation of hazardous material under contract with any department of the executive branch of the federal government.	49 USC §§ 5101-5127 49 CFR § 171.2(f), 171.2(g), 172.300 - 172.304, 172.312, 172.400, and 172.504	Relevant and appropriate	These requirements are relevant and appropriate for transporting hazardous materials on site.

TABLE 2-6 (continued)
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs
SITE 29 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Clean Air Act (42 USC §7401-7671)					
Excavation and handling of soil	Requirements are established to limit the quantity of particulate matter.	Excavation	BAAQMD Regulations 6-301, 6-302, and 6-305	Relevant and appropriate	These requirements are applicable to Alternative 3 excavation activities. Excavation and handling of soil and debris must be conducted in compliance with these requirements.
Excavation and handling of soil	Provides requirements for maintaining, covering and stockpiling excavated soil.	Excavation	BAAQMD Regulation 8, Rule 40	Relevant and appropriate	Applicable to Alternative 3 excavation activities. Excavation and handling of soils and debris must be conducted in compliance with these requirements.
Demolition involving asbestos	Provides requirements for demolition practices	Demolition of buildings containing asbestos	40 CFR. § 61.140-157	Applicable	Applicable to Alternative 3 if buildings contain asbestos
Discharge to air	Limits emissions of lead to atmosphere	Lead emissions	BAAQMD Regulation 11	Relevant and appropriate	This regulation limits emission of lead from emission points. It may be relevant and appropriate depending on the amount of lead discharged.

Notes:

ARAR	Applicable or Relevant and Appropriate Requirement
BAAQMD	Bay Area Air Quality Management District
CAA	Clean Air Act
CCR	California Code of Regulations
CFR	Code of Federal Regulations
DOT	Department of Transportation
LDR	Land Disposal Restriction
RCRA	Resource Conservation and Recovery Act
SIP	State Implementation Plan
USC	United States Code

TABLE 2-7
POTENTIAL STATE ACTION-SPECIFIC ARARs
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Cal-EPA Department of Toxic Substances Control					
Disposal of lead	Waste that contains lead in excess of 350 parts per million must be disposed of at a Class I hazardous waste disposal facility	Lead in excess of 350 parts per million	California Health & Safety Code § 25157.8	Applicable	Potentially applicable if lead is found in excess of 350 parts per million

Notes:

ARAR Applicable or relevant and appropriate requirement
Cal-EPA California Environmental Protection Agency

TABLE 5-1
COMPARISON OF REMEDIAL ALTERNATIVES
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Evaluation Criteria	**Alternative 1 No Action***	**Alternative 2 Land Use Controls***	**Alternative 3 Excavation and Off-site Disposal***
Overall protection of human health and the environment	1	4	5
Compliance with ARARs	5	5	5
Long-term effectiveness	1	4	5
Reduction of toxicity, mobility, and volume	1	1	4
Short-term effectiveness	1	5	3
Implementability	5	4	3
State Acceptance	1	5	5
Community Acceptance	1	NR	NR
Cost	5	4	1
Sum	21	32	31
Overall Ranking[1]	3	1	2

Notes:

*Rating Scale	5 meets criterion best, 1 meets criterion least
[1]Overall Ranking	1 has best criterion ranking, 3 has lowest criterion ranking
ARAR	Applicable or relevant and appropriate requirement
NR	Not rated

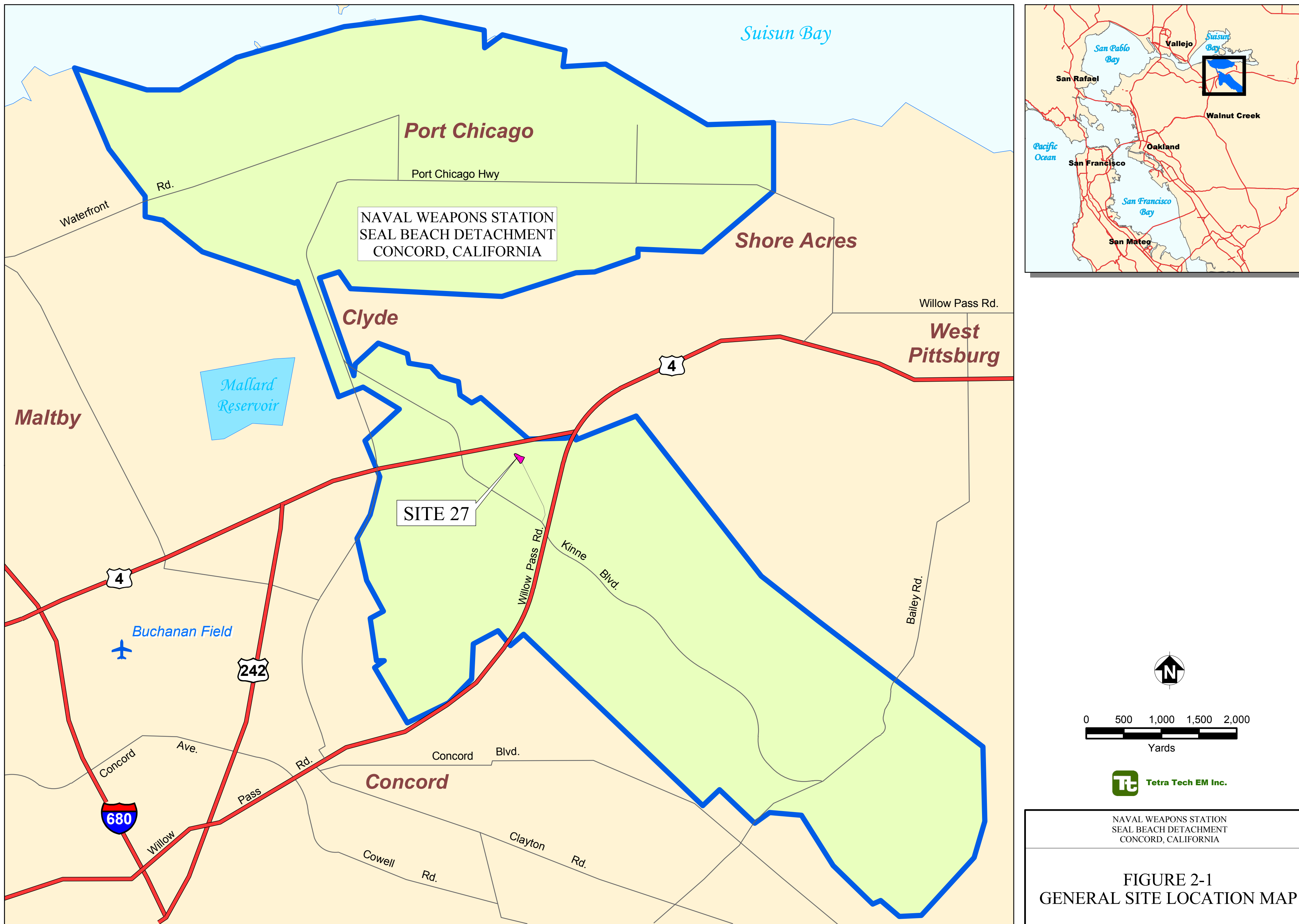
TABLE 5-2
COST ESTIMATE SUMMARY FOR REMEDIAL ALTERNATIVES
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Alternative	Capital Cost	Annual O&M Cost[1]	Total NPV Cost[2]
1. No action	$0	$0	$0
2. Land use controls	$24,000	$97,000	$121,000
3. Building Demolition and Debris Disposal/ Soil Excavation and Incineration Off-Site	$682,000	$0	$682,000

Notes:
(1) Annual O&M cost assumes annual monitoring for the next 30 years.
(2) Total NPV cost includes capital costs and NPV of annual O&M cost. Present value calculation is based on a 3.9 percent discount rate.
NPV Net present value
O&M Operation and maintenance

FIGURES

01/28/2002 V:\Concord\Projects\Cto144\Fig2-1.mxd TtEMI-SF AZ



NAVAL WEAPONS STATION
SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA

FIGURE 2-1
GENERAL SITE LOCATION MAP

Figures 2-2 & 2-3

These detailed station maps have been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

APPENDIX A

PRELIMINARY REMEDIATION GOAL-BASED
HUMAN HEALTH RISK ASSESSMENT

APPENDIX A

PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT

CONTENTS

CONTENTS (Continued)

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TABLES

Table

ACRONYMS AND ABBREVIATIONS

µg/kg	Microgram per kilogram
BGS	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
Cal/EPA	California Environmental Protection Agency
CFC	Chlorofluorocarbon
COPC	Chemicals of potential concern
CSS	Composite soil sample
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
DL	Detection limit
DQO	Data quality objectives
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
ERM	Environmental Resource Management
HHRA	Human health risk assessment
HI	Hazard index
HLA	Harding Lawson Associates
HQ	Hazard quotient
IA	Investigation Area
IAS	Initial Assessment Study
ID	Identification number
IT Corp.	IT Corporation
mg/kg	Milligram per kilogram
MTL	Material Testing Laboratory
NCP	National Contingency Plan
OC	Organochlorine
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethene
PPM	Part per million
PRC	PRC Environmental Management, Inc.
PRG	Preliminary remediation goal
QA/QC	Quality assurance and quality control
QAPjP	Quality assurance project plan
QCSR	Quality control summary report

ACRONYMS AND ABBREVIATIONS (Continued)

RfD	Reference dose
RI	Remedial investigation
RME	Reasonable maximum exposure
SBD	Seal Beach Detachment
SF	Slope factor
SI	Site investigation
SQL	Sample quantitation limit
SVOC	Semivolatile organic compound
TPH	Total petroleum hydrocarbons
TPH-D	Total petroleum hydrocarbon as diesel
UCL_{95}	95 percent upper confidence level on the arithmetic mean
UST	Underground storage tank
VOC	Volatile organic compound
WQEC	Weapons Quality Engineering Center

1.0 INTRODUCTION

This appendix presents the preliminary remediation goal (PRG)-based human health risk assessment (HHRA) (PRG-based HHRA) for Site 27 (the Site) at the Naval Weapons Station Seal Beach Detachment (SBD), Concord, California. Methodology and scope for the PRG-based HHRA were developed using methods consistent with U.S. Environmental Protection Agency (EPA) (1989a, 2000) and the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (Cal/EPA 1994). Cancer risks and non-cancer adverse health effects (hazard indices [HI]) for all chemicals of potential concern (COPC) in soil were estimated using EPA Region 9 PRGs (EPA 2000).

The purpose of the PRG-based HHRA is to provide risk managers with a basis for evaluating the need to mitigate potential health effects from exposure to contaminants detected in soil at the Site. Historical uses of pesticides in limited areas of the Site have been recorded and acknowledged by the U.S. Department of the Navy (Navy). As a result, potential health impacts were specifically evaluated for chemicals detected adjacent to Building Investigation Area (IA)-20 and IA-36 (see Figure A-1).

For comparative purposes, potential health impacts associated with chemicals detected at the Site, excluding Buildings IA-20 and IA-36 as well as the entire site, were also estimated. Potential impacts associated with both current and future site configurations to a resident and an industrial worker were evaluated herein. The PRG-based HHRA was conducted using a streamlined approach for evaluating potential human health impacts using exposure point concentrations (EPC) and EPA-published PRGs (EPA 2000). This approach is numerically equivalent to conducting the “forward calculations” typically performed for a baseline HHRA if the exposure pathways and assumptions used to derive the PRGs are the same as those used in the forward calculations. The PRG-based HHRA is considered appropriate to evaluate the Site for the following reasons:

- The primary exposure pathways of concern at the site are the same as those evaluated within the PRG framework. These pathways include ingestion of soil, dermal contact with soil, and inhalation of chemical vapors or airborne dust released from soil.

- The receptors identified at the Site are base personnel, base visitors, and residents. Industrial and residential exposures are evaluated within the PRG framework. Exposures for the identified receptors are expected to be equivalent to or less than, the industrial and residential exposures evaluated within the PRG framework.

- Preliminary data review indicates that chemical concentrations at the Site are relatively low.

The remainder of this appendix describes the methods used to conduct the PRG-based HHRA. Figures and tables for this appendix are provided after the References, followed by three attachments:

- Attachment A1: Presents all the data used to conduct the PRG-based HHRA.
- Attachment A2: Summarizes chemical-specific cancer risks and non-cancer adverse health effects for the reasonable maximum exposure (RME) scenario.
- Attachment A3: Summarizes chemical-specific cancer risks and non-cancer adverse health effects for the maximum exposure scenario.

The information presented in Sections 2.0 through 3.0 briefly describes the Site, historical uses of the Site, and previously conducted site investigations conducted at the Site. For more detailed information refer to the main sections of the FS.

2.0 SITE DESCRIPTION AND HISTORY

The Site is located on the east side of H Street, approximately 800 feet south of the State Highway 4 causeway (Figure A-1). Buildings IA-20 and IA-36 are located at the northwestern end of a cluster of buildings and sit on a slight rise above a driveway that serves the cluster of buildings. North of Buildings IA-20 and IA-36 is a drainage swale, which drains to the west. Above the drainage swale is a steep grass- and brush-covered hill that slopes to the southwest. The Contra Costa Canal is approximately 150 feet upslope from the site, and the State Highway 4 causeway is farther upslope.

Building IA-20 formerly housed a chemical laboratory and a materials testing laboratory of the WQEC (Weapons Quality Engineer Center) Scientific and Engineering Division, and Building IA-36 was a boiler house; both facilities are currently vacant. The chemical laboratory was primarily used to test oil and hydraulic fluids and to develop new weapons test methods. The materials testing laboratory was used to evaluate the structure integrity and dynamics of ordnance casings, shells, and missiles (PRC Environmental Management, Inc. [PRC] 1996). The initial assessment study (IAS) of Naval Weapons Station SBD Concord reported that the amount of laboratory waste generated in Building IA-20 was less than 100 pounds per year and consisted mostly of test fluids and steel, brass, and aluminum scraps and shavings. In addition, small quantities of acids and bases were also generated at the laboratory. From 1983 on, the laboratory collected and disposed of its waste off site (Ecology and Environment, Inc. [E&E] 1983).

3.0 PREVIOUSLY CONDUCTED SITE INVESTIGATIONS

This section briefly summarizes previously conducted investigations at Site 27. These investigations include the IAS, site investigation (SI), underground storage tank (UST) investigation, and remedial investigation (RI). The analytical data from soil collected during these investigations were used in the HHRA.

3.1 INITIAL ASSESSMENT STUDY

The IAS did not designate Building IA-20 as a specific site, but activities and past disposal practices at Building IA-20 were reported in another part of the IAS report (Section 6.0 - Activity Findings, E&E 1983). The IAS originally reported at Site 18, a reported burn pit and solvent disposal area behind Building IA-25, showed no visible evidence of contamination. Two investigations were conducted at Building IA-25, one by the Navy in November 1988 and the second by International Technology Corporation (IT Corporation) in January 1990. The analytical results for these investigations showed no evidence of disposal activity behind Building IA-25, as described in the IAS (IT Corporation 1989). Because no contamination was detected behind Building IA-25 and the IAS reported that chlorofluorocarbon (CFC)-113 was routinely disposed of onto the soil behind Building IA-25 at a rate of 1 gallon per week between 1964 and 1968, IT Corporation believed that the IAS incorrectly reported Building IA-20 activities as occurring at Building IA-25. Therefore, IT Corporation concluded that Site 18 activities in the IAS occurred at Building IA-20. Subsequently, the Building IA-20 area was designated Site 27 (IT Corporation 1989).

Site studies reported three past activities that may be of concern at Site 27: (1) the IAS reported CFC-113 disposal behind Building IA-20, although this contaminated soil was reportedly excavated and removed (E&E 1983); (2) IT Corporation speculated that solvent disposal possibly occurred in the area behind Building IA-20; and (3) IT Corporation also speculated that a burn pit was possibly located behind Building IA-20.

3.2 SITE INVESTIGATION

As indicated in Figure A-1, soil samples from twenty locations were composited into twelve discrete composite soil samples (CSS) for the SI. CSS were collected at 0 to 0.5 ft below ground surface (bgs) 2.5 to 3.0 foot bgs depth intervals. These sample locations are depicted graphically on Figure A-1. The soil at the site is identified as silty-clay to a depth of 3 feet bgs with some sandy fill in surface samples collected along the sides of the buildings. There was no visible evidence of soil removal from behind Building IA-20 to indicate that possible CFC-113 contaminated soil was removed from the area, as reported in the IAS. To investigate the reported disposal activities at the Site, soil samples were analyzed for CFC-113, polychlorinated biphenyls (PCB), pesticides, pH, and sulfate, total petroleum hydrocarbons (TPH), and volatile organic compounds (VOCs). The soil samples were field-screened for PCBs and TPH. The analytical laboratory results were used to verify the field screening results.

No CFC-113 was detected in the soil samples. The maximum detected concentrations of VOCs were 2-butanone at 3 micrograms per kilogram (µg/kg), acetone at 110 µg/kg, carbon disulfide at 6 µg/kg, methylene chloride at 0.026 milligrams per kilogram (mg/kg), and toluene at 0.013 mg/kg. All maximum detected VOC concentrations were found in the swale samples with the exception of toluene, which was detected in sample MTL-09-CDD, collected between Buildings IA-20 and IA-36. The maximum concentrations of TPH as gasoline (TPH-G) and TPH as diesel (TPH-D) were 0.349 and 11.9 mg/kg, respectively. All of the TPH concentrations were found in the swale, with the exception of TPH-D in sample MTL-10-CSS, collected between Buildings IA-20 and IA-36. No chlorinated solvents, such as tetrachloroethene (PCE), were detected in any of the soil samples. No PCBs were detected in the soil samples. The maximum detected concentrations of pesticides were p,p-dichlorodiphenyldichloroethane (DDD) at 0.313 mg/kg; p,p-dichlorodiphenyldichloroethene (DDE) at 0.103 mg/kg; 4,4'-dichlorodiphenyltrichloroethane (DDT) at 0.442 mg/kg; dieldrin at 0.0734 mg/kg; heptachlor epoxide at 0.00952 mg/kg; alpha-chlordane at 0.723 mg/kg; and gamma-chlordane at 0.821 mg/kg. The pH in the soil samples ranged from 7.7 to 9.36, and sulfate concentrations ranged from 4.54 to 43.10 mg/kg.

3.3 UST INVESTIGATION

In September 1993, an investigation of the soil around the 10,000-gallon diesel fuel UST located along the southwestern side of Building IA-36 was conducted. One boring was drilled along the southwestern side of the UST. Samples were collected at depths of 7.5, 11, and 16 feet bgs and were analyzed for TPH-D, TPH-G, and pesticides. TPH-D was detected at 620 mg/kg in the sample collected at 11 feet bgs (Harding Lawson and Associates [HLA] 1995). The base of the UST was measured at approximately 10 feet bgs.

On April 15, 1997, the UST was excavated and removed, and soil was excavated down to 11 feet bgs in a 10-foot-wide by 29-foot-long area. Two soil samples were collected at 12 feet bgs and were analyzed for TPH-D; benzene, toluene, ethylbenzene, and total xylenes (BTEX) pesticides; and PCBs; one at the northern end of the excavation and one at the southern end of the excavation. No pesticide or PCB concentrations were detected in either soil sample. Laboratory results from the northern sample showed no detectable BTEX or TPH-D concentrations; however, the sample from the southern end of the excavation contained concentrations of TPH-D at 950 mg/kg, ethylbenzene at 0.66 mg/kg, and total xylenes at 1.8 mg/kg.

An additional excavation occurred on April 28, 1997 because results from the soil sample in the southern portion of the tank pit indicated that soil was impacted with petroleum hydrocarbons; the southern half of the tank pit was excavated to a depth of 25 feet bgs. No groundwater was encountered in the excavation. At the time of the second excavation, a block of soil and bedrock underlying a portion of Building IA-36 caved into the excavation; the concrete floor of a portion of Building IA-36 was exposed by the undercaving. The mass of material backfilled the overexcavated area from 25 to 21 feet below grade. Additional excavation was not performed because of the potential instability of the sidewall beneath Building IA-36, and clean imported backfill material was placed in the excavation to provide a buttress against further caving (KTW & Associates 1997). Before placing backfill material into the excavation, one soil sample was collected from the southeastern sidewall at a depth of 19-feet bgs. No BTEX, pesticides, PCBs, or TPH-D were detected in the sample.

It was concluded that diesel-impacted soil was substantially removed and only residual diesel-impacted soil remains in the ground adjacent to Building IA-36 (KTW & Associates 1997). The Contra Costa County Health Services Department issued a letter recommending no further action for the site on February 13, 1998 (Contra Costa County Health Services Department. 1998).

3.4 REMEDIAL INVESTIGATION

This section summarizes the results of the RI related to chemical characterization, human health risk assessment, and contaminant fate and transport (PRC 1996).

3.4.1 Chemical Characterization

During the RI, soil was sampled at the Site to assess the nature and extent of organochlorine (OC) pesticides and petroleum hydrocarbons in soils as a result of waste disposal practices and use of a fuel UST. Sampling focused on a drainage swale where waste was reportedly dumped, site building perimeters (including the diesel fuel UST), and the site drainage channel. Soil was sampled by surface grab sampling and Geoprobe borings.

OC pesticides were detected in the majority of the soil samples collected at the Site. Chlordane isomers and 4,4'-DDT were detected in samples collected from the building perimeters at concentrations exceeding EPA Region 9 residential PRGs. Pesticide concentrations diminish with distance from the building areas and are not significantly greater in the swale bottom or drainage ditch than in the background samples, indicating probable use of pesticides for surface applications around buildings rather than disposed of in the swale. No pesticide concentrations at depths below 0.5 foot bgs exceeded residential PRGs. Conversely, PCBs were not detected in the building perimeter soil samples, but rather in the other sampling areas including background locations. PCB concentrations in these areas exceeded PRGs.

SVOCs were detected in the building perimeter area at concentrations less than PRG values. The spatial distribution of TPH at the Site indicated that motor oil range compounds were used for surface applications around buildings, possibly as a weed or dust suppressant, or as a pesticide. Elevated hydrocarbon concentrations near the UST are likely the result of fuel handling. This UST was removed in 1997, and surrounding soil was excavated and backfilled (KTW& Associates 1997). According to the RI, TPH-motor oil in the drainage ditch sample may have been the result of either the motor oil at the Site or surface runoff from the parking areas and roads near the Site. Soil in the swale bottom and background area was relatively unaffected by TPH.

3.4.2 Previously Conducted PRG-Based Human Health Risk Assessment

As part of the RI, a PRG-based HHRA was conducted. Pesticides and PCBs exceeded residential and industrial PRGs at the Site. Alpha- and gamma-chlordane detections exceeded a residential risk of 1×10^{-4} at MTLSB014. The corresponding industrial risk associated with this sample was 3×10^{-5}. Chlordane, dieldrin, and 4,4'-DDD were present in three additional surface soil samples collected adjacent to Buildings IA-20 and IA-36 at concentrations equivalent to 7×10^{-6} to 8×10^{-5} residential cancer risks, while industrial cancer risks ranged from 2×10^{-6} to 2×10^{-5}. With the exception of the residential risk estimate for chlordane from sample MTLSB014 (Figure A-1), total cancer risks for samples collected adjacent to the buildings fell within EPA's risk range of 1×10^{-4} to 1×10^{-6} for carcinogens. Chlordane was also detected in other samples collected in the drainage system and hillside ambient areas at a maximum concentration equivalent to a 6×10^{-7} residential cancer risk.

Aroclor isomers were the only carcinogenic constituents detected in samples from the site drainage system or hillside ambient areas at concentrations above a 1×10^{-7} residential cancer risk. However, the Aroclor risk estimates were within the target risk range based on both residential and industrial exposures (for example, 5×10^{-6} to 2×10^{-5} residential risks and 9×10^{-7} to 4×10^{-6} industrial risks). Total residential site cancer risk in the drainage system (based on maximum detections of Aroclor and the chlordane isomers) was approximately 2×10^{-5}, primarily due to the Aroclor detections.

3.4.3 Contaminant Fate and Transport

The COPCs that were detected in soil samples above screening criteria were chlordane, DDT, and PCBs, which have low mobility and high persistence. According to the RI, the chlordane source is likely from application around the buildings for termite control; the DDT source is likely from pesticide application around the buildings (PRC 1996). The source of the PCBs is not evident. The surface soil containing these COPCs could have been transported off site with stormwater discharge from the Site. TPH-D or TPH as motor oil was detected in the soil samples collected in the drainage swale, from the drainage ditch, and around the buildings. Both the TPH-D and TPH as motor oil appeared to result from leaks, spills, or applications of TPH. TPH as motor oil could have been transported off site from stormwater runoff into the drainage channel.

4.0 METHODS USED TO CONDUCT THE PRG-BASED HHRA

The methods used to conduct this PRG-based HHRA for the Site are based on EPA and Cal/EPA risk assessment guidance, as noted below:

- "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, (Part A)" (EPA 1989a)
- Region 9 PRGs Memorandum (EPA 2000)
- "Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities" (Cal/EPA 1992)
- "Recommended Outline for Using U.S. Environmental Protection Agency Region 9 Preliminary Remediation Goals in Screening Risk Assessments at Military Facilities" (Cal/EPA 1994).

The EPA and Cal/EPA risk assessment framework consists of the following four basic steps:

Step 1 -- Data Evaluation and Selection of Chemicals of Potential Concern: The first step consists of reviewing and evaluating available data and identifying COPCs in the environmental media at the site. Extensive data review is conducted during the HHRA to determine whether site conditions are adequately represented by the data.

Step 2 -- Exposure Assessment: The exposure assessment represents some of the most significant work required to conduct a HHRA. Under the exposure assessment, potential human populations and related exposure pathways are identified based on current and expected future land uses. This step also involves estimating EPCs based on measured or modeled COPC concentrations. EPCs are used to estimate pathway-specific intakes (doses) for use in subsequent risk calculations. However, for any COPCs in soil, EPCs were not specifically modeled, and daily intakes were not estimated. These steps are, however, incorporated into the development of the PRGs.

Step 3 -- Toxicity Assessment: The toxicity assessment mainly involves compiling toxicity values. These elements of a toxicity assessment have already been incorporated into the development of the PRGs and are therefore not specifically conducted in the HHRA.

Step 4 -- Risk Characterization: The fourth step combines the results of the previous three steps to provide a quantitative characterization of potential cancer risks and non-cancer adverse health effects to human health associated with exposure to COPCs. This step clearly distinguishes the two separate methods used to estimate cancer risks and non-cancer hazard indices (estimates of non-cancer adverse health effects). The risk characterization process also involves combining chemical- and pathway-specific cancer risks and HIs to determine a total cancer risk and non-cancer result.

EPA Region 9 PRGs (EPA 2000) represent risk-based concentrations that correspond to a cancer risk of 10^{-6} or a hazard quotient (HQ) of 1, based on standardized equations (EPA 1989a) that combine exposure assumptions (Step 2) with EPA toxicity data (Step 3). The PRGs are developed for exposure to residential and industrial soil, ambient air, and tap water. PRGs have not been developed for any other exposure scenarios (for example, construction and open space/recreational). Generally, PRGs are developed and updated annually by EPA Region 9. To date (as of March 1, 2002), the most recent PRGs were published in 2000. Sections 10.1 and 10.2 describe the methods used to estimate cancer risks and non-cancer adverse health effects for the Site. The results are discussed in Section 11.0 and Section 12.0 discusses key uncertainties associated with the HHRA.

5.0 DATA EVALUATION

This section describes the data evaluation methods used to conduct the PRG-based HHRA. Only soil was sampled at the Site. Groundwater impacts (from COPCs) are not expected for the following reasons:

- It was determined in the IAS that groundwater sampling was not necessary because the chemical detected were confined to the surface soils of the site.
- Application or disposal of site-related chemicals (COPCs) and laboratory wastes were assumed to occur only in limited concentrations applied directly onto or near surface soils (that is, no subsurface deposition was assumed).
- Historical records indicate that chemicals, such as chlordane, were only applied according to manufacturers' specifications.
- Pesticides, such as chlordane, typically adhere readily to soil particles because of their physical and chemical properties.
- The Site is situated on a hill with a drainage slope leading directly to a storm drain, and any chemicals on the surface would likely be transported off site (versus down into groundwater)
- A UST was removed from the Site and chemically impacted soil (TPH) was excavated and moved off site by KTW and Associates Inc. (1997).

For the reasons listed above, only soil samples were collected from the site. The available analytical data for the site includes results from the IAS, SI, UST investigation, and RI.

5.1 CHEMICAL ANALYSES

All soil samples were analyzed for the presence of pesticides, SVOCs (including polynuclear aromatic hydrocarbons [PAH]), and VOCs. Site soil samples were not analyzed for metals, because the historical source of contamination at the site is liquid organic waste disposal and historical application of pesticides.

5.2 EPA DATA VALIDATION

As part of the data evaluation process, all analytical data were reviewed to verify that data met EPA data quality criteria for use in the risk assessment.

Data validation of samples followed EPA data validation guidelines (EPA 1994a and 1994b). To summarize the data validation process, all RI data were subject to a cursory review, and 10 percent of the data were fully validated. The cursory review evaluated key quality assurance and quality control (QA/QC) information such as holding times, calibration requirements, and spiking accuracy. The full validation evaluated additional QA/QC criteria and used the raw data to check calculations and analyte identifications. The overall objective of data validation was to verify that the analytical data met EPA guidelines for adequacy based on precision, accuracy, representativeness, completeness, and comparability (PARCC). At each stage of the validation, qualifiers were assigned to the results according to EPA guidelines (EPA 1994a and 1994b) and the associated analytical methods.

The data validation results are documented in a quality control summary report (QCSR) presented in Appendix I (of the RI report (TtEMI 1997). The QCSR includes a discussion of the PARCC parameters, an evaluation of how well the data met the PARCC parameter goals established in the quality assurance project plan (QAPjP), and a summary of how meeting these PARCC goals helps achieve the data quality objectives (DQOs) for the RI. The RI data were found to meet all requirements of "definitive data" as described in *Data Quality Objectives Process for Superfund* (EPA 1993). Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Definitive data are also analyte-specific, with confirmation of analyte identity and concentration (EPA 1993). All data without qualifiers and all data qualified as estimated (J) were used in the risk assessment. The data qualified as not detected (U) were also incorporated into the risk assessment by using a proxy concentration of one-half the sample quantitation limit. Only data qualified as rejected (R) were considered unusable for risk assessment purposes (EPA 1989a and 1992a).

General data quality issues of particular concern for the risk assessment are summarized below.

- Certain VOCs, SVOCs, pesticides, and PCB isomers have been qualified as nondetected (U) as a result of blank contamination. Further information on blank contamination is presented in Appendix I of the RI report (TtEMI 1997).

- As part of the data evaluation process, the sample quantitation limits (SQL) were compared to soil PRGs for residential land use (EPA 2000). For some constituents, SQL was greater than the corresponding PRG (see Appendix I of the RI report [TtEMI 1997]). In those cases, the constituents may have been present at concentrations equal to a risk greater than 10^{-6} or hazard of 1, but would not have been reported. However, lower reporting limits were not generally attainable using conventional analytical techniques. For analytes for which the reporting limit exceeds the residential soil PRG, a discussion of the impact to selection of COPCs and to the results of the HHRA is provided in Appendix I of the RI report (TtEMI 1997).

A complete list of soil point identification numbers (IDs) and sample IDs used for the HHRA is presented in Table A-1. The complete set of data used in the PRG-based HHRA is presented in Attachment A1. The twelve CSSs collected at the Site as part of the SI were not used to conduct the PRG-based HHRA because they are not discrete data points and the maximum detected concentrations in CSS samples are between 1 and over 6 orders of magnitude below residential PRGs. VOCs were only detected in the CSSs. but concentrations were at very low levels as noted in the table below:

VOC Detected in CSS Soil Samples	Maximum Detected Concentration (mg/kg)	Residential PRG (mg/kg)	Comment
2-Butanone	0.003	7,300	Common laboratory contaminant
Acetone	0.110	1,600	Common laboratory contaminant
Carbon disulfide	0.006	360	None
Methylene chloride	0.260	8.9	Common laboratory contaminant
Toluene	0.013	520	None

5.3 DISTINCT DATA SETS

Potential health impacts were evaluated for three separate areas at the Site under current and future site configurations. Potential health impacts were evaluated for the following:

- Samples collected around the perimeter of Buildings IA-20 and IA-36
- Samples collected from the whole site, excluding at the perimeter of Building IA-20 and IA-36 and
- The entire Site 27 area.

Samples collected from the following four point IDs were used to represent conditions at the perimeter of Buildings IA-20 and IA-36: MTLSB014; MTLSB017; MTLSB018; MTSB019. The remaining soil samples were used to represent conditions at Site 27 excluding the area occupied by the two buildings. Soil conditions underneath the buildings are unknown.

5.3.1 Current Versus Future Site Configurations

Analytical data for soil were divided into two subsets corresponding to the depth intervals evaluated in the HHRA. These two soil depth interval subsets are described below:

- Surface soil subset for soil samples collected from 0 to 0.5 foot bgs; used to evaluate potential exposures associated with the current site configuration.
- Subsurface soil subset for soil samples from 2 to 4 feet bgs; used to assess a future site configuration (under the assumption that subsurface soil will be mixed and redistributed to the surface as a result of regrading or excavation).

For health impacts associated with future site configuration scenarios, typically, chemical impacts down to 10 feet bgs are evaluated. Soil samples at the Site, however, were not collected beyond 4 feet bgs.

5.4 STATISTICAL SUMMARY

No soil samples, except near the UST, were collected below a depth of 4 feet bgs at the Site. Soil data collected and analyzed for the Site were statistically analyzed, and the following information was estimated for all chemicals detected at least once:

- Frequency of detection
- Maximum detected concentrations
- Minimum detected concentrations
- Mean (arithmetic mean)
- 95th percentile upper confidence limit of the arithmetic mean (UCL_{95})
- RME concentration (lesser of the UCL_{95} or the maximum detected concentration)
- Distribution of collected sample results

Soil data are summarized in Tables A-2 through A-6 for each area evaluated. Consistent with EPA (1989a) risk assessment guidelines, a "proxy" value of one-half the SQL was used to represent nondetected sample results if a chemical was detected at least once. Means were calculated using distribution-dependent formulas. Distributions were determined using normal and lognormal probability plots and a goodness-of-fit test (Shapiro-Wilk W test). For normal distributions, mean concentrations were calculated as the arithmetic mean of the data set. For lognormal distributions, mean concentrations were calculated using Gilbert equation 13.3 (1987). For unknown distributions and data sets with three or fewer detected values, means were calculated as the 50^{th} percentile (median) of the data set (Tables A-2 through A-6).

6.0 IDENTIFYING CHEMICALS OF POTENTIAL CONCERN

COPCs are chemicals included in the quantitative exposure estimation and risk characterization steps of the HHRA. Except for TPH, if a chemical was detected at least once in soil, it was retained as a COPC as described below. COPCs include organochlorine pesticides, PCBs, and SVOCs.

TPH mixtures were not selected as COPCs. As recommended by Cal/EPA (1993), constituent-specific TPH indicator chemicals (that is, BTEX; other individual monocyclic aromatic compounds; PAHs; and other component compounds that have published toxicity values assigned by EPA or Cal/EPA) were instead evaluated to assess potential health risk from TPH contamination. TPH mixture data were excluded from further evaluation in the risk assessment because they are considered inadequate and insufficient to evaluate risk from TPH contamination (Cal/EPA 1993).

7.0 EXPOSURE ASSESSMENT

An exposure assessment typically involves a description of the exposure setting and land use, a detailed analysis of potentially exposed human receptors, selection of potentially complete exposure pathways and appropriate intake assumptions, estimation of EPCs, and estimation of chemical daily intakes. Many of these steps have already been incorporated into the development of the PRGs and therefore do not need to be performed specifically as part of this assessment. Specific information about site exposure setting and land use is included to demonstrate that use of PRGs for the PRG-based HHRA are protective of these exposures.

7.1 EXPOSURE SETTING AND LAND USE

The exposure setting for the Site, including land use, climate, topography, geology, and hydrology is described in Section 2.1 of the RI report (PRC 1996). Naval Weapons Station SBD Concord is an operational naval base and is not scheduled to close. Currently and in the foreseeable future, the Site use will remain unchanged.

7.2 POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

The selection of current receptors is based on current land use activities at the site. The primary receptors identified are base personnel. For purposes of this risk assessment, activities of current base personnel were assumed to be similar to those of an industrial worker as defined by the EPA Region 9 PRG (EPA 2000). Base visitors were also identified as potential receptors. A separate screening-level assessment of potential base visitor risks was not made because the exposure and risk estimates for an industrial worker are expected to provide an upperbound estimate of risks for a visitor (that is, will conservatively over estimate exposures to a visitor). The EPA (2000) industrial soil PRGs were used to assess risk associated with current industrial (base) worker exposure to COPCs detected in soil at the Site.

Potential future receptors were identified based on projected future land use and probable future activity patterns at each site. The most probable future receptors are base personnel; a future industrial (base) worker was therefore identified as a potential future receptor. However, although very unlikely, it was conservatively assumed that land use may be unrestricted in the future and that residential developments may be constructed at the Site. The EPA (2000) residential soil PRGs were used to assess risk associated with hypothetical future residential exposure to COPCs detected in soil at the Site.

The frequency and duration of exposure to soil COPCs assumed for the industrial and residential receptors are specifically defined in the EPA Region 9 PRGs memorandum (EPA 2000).

7.3 COMPLETE EXPOSURE PATHWAYS

As indicated above, only chemicals detected in soil were evaluated. Groundwater impacts are not expected and were therefore not quantified in this assessment. Potentially complete exposure pathways associated with this medium are discussed below. The identified potential human receptors and associated complete exposure pathways evaluated in this assessment are depicted on the conceptual site model.

The primary medium of concern was soil. The risks associated with industrial and residential land use were evaluated using analytical data obtained from both surface soil (0 to 0.5 feet bgs) and subsurface soil (0 to 4 feet bgs). Industrial and residential exposures to surface soil COPCs were evaluated assuming that the site configuration may change in the future. If earth moving and excavation activities were to occur, potential exposure to subsurface soils would also occur. Under future site conditions, Cal/EPA recommends evaluating chemicals down to 10 feet bgs (Cal/EPA 1992). As noted previously, relevant soil samples were collected down to 4 feet bgs. As a result, potential exposures under a future site configuration to COPCs (0 to 4 feet bgs) were also evaluated.

Potential industrial and residential exposure to surface and subsurface soil was assessed for three exposure pathways, consistent with the exposure pathways used to develop the soil PRGs:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of airborne particulates or VOCs released from soil while outdoors

Although potentially relevant to the Site, the PRGs do not account for inhalation of COPC vapors released from soil to indoor air. However, this exposure pathway was not evaluated because detections of VOCs in soil at the Site are minimal. The potential impact of excluding this exposure pathway in the HHRA results is discussed in the Uncertainties Analysis section (Section 12.0).

7.4 INCOMPLETE EXPOSURE PATHWAYS

Groundwater and produce at the site were evaluated for potential exposure pathways, but all pathways associated with these media were identified as incomplete. No exposure is expected to occur from incomplete exposure pathways, and incomplete pathways are not addressed further in the PRG-based HHRA. The rationale for identifying the exposure pathways associated with groundwater and produce as incomplete is provided below.

7.4.1 Groundwater

Groundwater from the shallow Bay Mud aquifer that underlies the site is not suitable for use as a drinking water source, based on low hydraulic conductivity of the aquifer, and high TDS, hardness, chlorides, and iron concentrations in the water (IT Corp. 1992). Groundwater samples were not collected during the RI because results of prior investigation activities did not indicate that contaminants were present in groundwater. As a result, the groundwater pathway was not evaluated in the PRG-based HHRA.

Most private and city municipal water in the region is supplied by treated surface water sources, although some wells in the vicinity of the NWS SBD Concord Inland Area are used for water supply, including several wells in the industrial complex area to the west of Naval Weapons Station SBD Concord, which are used primarily for process water and cooling water. Groundwater from a series of potable water wells surrounding Mallard Reservoir, also located west of NWS SBD Concord, is used to augment aqueduct supplies of drinking water to the reservoir during droughts; however, IT Corp. reports that these wells have been used only three times since the mid-1960s (IT Corp. 1992). Groundwater flows northward toward Suisun Bay. Suisun Bay provides important habitats for aquatic life and supports a number of uses, including recreation, fishing, and shipping.

7.4.2 Produce

Since no produce is currently grown at Naval Weapons Station SBD Concord, so it was not possible to provide a direct assessment of the potential for human health risk associated with ingestion of hypothetical future produce grown at the Site. To estimate concentrations of contaminants that could occur in homegrown produce, modeling techniques are typically employed; however, the uncertainties associated with the use of default input parameters and assumptions in such models are high.

In addition, because Naval Weapons Station SBD Concord is an operational naval base, current activities at the site are limited to industrial operations and maintenance activities performed by base personnel. Residential exposure to contaminants in homegrown produce is very unlikely under these land use conditions and was not evaluated in this assessment.

8.0 TOXICITY ASSESSMENT

Typically, the toxicity assessment involves a review of agency literature and the subsequent compilation of cancer slope factors (SF) and reference doses (RfD) that are used to estimate cancer risks and HIs. Issues are also considered regarding the evaluation of appropriate toxicity values that include selecting appropriate surrogate toxicity values, route-to-route extrapolation, and an analysis of sources used to identify and select toxicity values. However, the development of PRGs already incorporates the results of these analyses.

The soil PRGs used in this assessment were taken from an electronic file available online from EPA Region 9 (EPA 2000). The PRGs are risk-based concentrations that correspond to a cancer risk of 10^{-6} or a hazard quotient (HQ) of 1. For most compounds, only one soil PRG and one tap water PRG are listed in the main PRG table. More than one PRG is listed for some compounds in the electronic file. The following decision rules were applied to compounds with more than one PRG:

- **PRGs with a "sat" notation -** Two soil PRGs are available for some VOCs: a risk-based PRG and a "sat" PRG that corresponds to the soil saturation limit of the compound. The saturation limit is the predicted concentration at which the compound is expected to be present in free phase, as a nonaqueous phase liquid (for compounds that are liquid at ambient temperatures), or as a solid phase (for compounds that are solid at ambient temperatures). EPA requested that the "sat" PRG be used in the HHRA.

- **PRGs with a "ceiling" notation** - Two soil PRGs are available for some compounds of low toxicity: a risk-based PRG and a "ceiling" limit PRG concentration of 100,000 mg/kg. EPA assigns a ceiling limit when the risk-based concentration is greater than 100,000 mg/kg. EPA requested that the "ceiling" PRG be used in the HHRA.

- **"Cal-modified" PRGs -** The Cal/EPA has developed cancer SFs that for a few chemicals differ significantly from the EPA SFs. As a result, some chemicals have two PRGs, one developed using the EPA SF and the other based on the Cal/EPA SF. The Cal-modified PRGs are lower (more health protective) than the corresponding EPA Region 9 PRGs. Cal/EPA requested that the "Cal-modified" PRGs be used for the HHRA, where available.

- **PRGs for carcinogens** - For some carcinogens, separate PRGs are available to assess their carcinogenic effects and their noncarcinogenic effects (EPA 2000). For these compounds, both PRGs were used to evaluate cancer risks and non-cancer health effects (that is, to calculate the HI).

In some cases, PRGs have not been developed for some of the COPCs. Where appropriate (based on structural similarities), surrogate (substitute) PRGs were selected to evaluate COPCs lacking a PRG. Table A-7 lists the soil PRGs and the surrogates used in this assessment.

9.0 EXPOSURE POINT CONCENTRATIONS

"Exposure point" describes a location or area, often hypothetical, where human receptors might encounter one or more contaminated environmental media. The concentrations of COPCs assumed to be present at an exposure point are known as EPCs. In a baseline HHRA, EPCs are estimated for each exposure medium (such as soil). EPCs were calculated for all COPCs identified for the current site configuration (0 to 0.5 foot bgs) and the future site configuration (0 to 4 feet bgs) at the Site. As noted above, because PRGs in soil account for the inhalation of vapors or particulates, EPCs in air were not estimated for any COPCs.

Based on EPA guidelines, the EPCs used in a risk assessment are the lesser of the maximum detected concentration and the UCL_{95} (EPA 1992b). This value represents an "upperbound" or a RME estimate of chemical concentrations. However, Cal/EPA indicates that the maximum concentration of each contaminant should be used as the EPC for comparisons against PRGs for screening-level risk assessments (Cal/EPA 1994). To address potential Cal/EPA concerns, cancer risks and HIs were estimated using maximum detected COPCs concentrations, and the results are summarized in Attachment A3. Soil EPCs for all COPC are summarized in Tables A-2 through A-6.

10.0 RISK CHARACTERIZATION

The risk characterization process combines the results of the exposure and toxicity assessments to address cancer risk and the risk of adverse non-cancer health effect separately. The risk characterization estimates the potential excess lifetime cancer risk and the potential for non-cancer adverse health effects for the identified receptors (industrial workers and hypothetical residents) from potential exposure to COPCs in soil at the Site. The following section summarizes the methods used to estimate non-cancer effects and excess lifetime cancer risks and presents the risk characterization results.

10.1 ESTIMATING IMPACTS ASSOCIATED WITH SOIL EXPOSURES

This section describes the methods used to estimate cancer risks and HIs associated with exposure to soil at the Site.

10.1.1 Excess Lifetime Cancer Risks for All Soil COPCs

Cancer risks were estimated using the following equation:

$$CR_i = (EPC_i \times cPRG_i^{-1}) \times 10^{-6} \qquad \text{(Equation 1)}$$

where:

- CR_i = Site-related excess lifetime cancer risk for chemical i (unitless)
- EPC_i = EPC for chemical i (mg/kg)
- $cPRG_i$ = Cancer-based PRG for chemical i (mg/kg)
- 10^{-6} = Value of the PRG cancer risk (the cancer risk associated with all cancer PRGs is 10^{-6}) (unitless)

A "total" cancer risk estimate was calculated by summing the CR_i values for all COPCs.

10.1.2 Estimating Adverse Non-cancer Health Effects for Soil COPCs

Adverse non-cancer health effects were estimated for each soil COPC using the following proportion equation:

$$HQ_i = (EPC_i \times nPRG_i^{-1}) \times 1 \qquad \text{(Equation 2)}$$

where:

- HQ_i = Site related hazard quotient for chemical i (unitless)
- EPC_i = EPC for chemical i (mg/kg)
- $nPRG_i$ = Non-cancer PRG for chemical i (mg/kg)
- 1 = Value of the PRG hazard quotient (the hazard quotient for all non-cancer PRGs is 1; unitless)

The HI or the "total" non-cancer estimate was calculated by summing all HQ_i values for all COPCs.

10.2 EPA CANCER RISK RANGE AND NON-CANCER THRESHOLD LEVEL

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that "for known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upperbound lifetime cancer risk to an individual between 10^{-6} and 10^{-4} (EPA 1990). Discussions in this risk assessment refer to 10^{-6} and 10^{-4} as the target range to provide a context for estimates of cancer risk. The EPA directive, "Memorandum Regarding the Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" (EPA 1991b), states that where cumulative cancer risks to an individual based on the RME for both current and future land use is less than 10^{-4} and no adverse non-cancer effects exist, action generally is not warranted unless adverse environmental impacts exist. A non-cancer HI of 1 or less indicates that little or no potential exists for adverse non-cancer health effects (EPA 1989a). EPA and Cal/EPAs Department of Toxic Substances Control recommend a risk management evaluation to protect human health when the risks are within the range of 10^{-6} to 10^{-4}.

The resultant cancer risks and HIs estimated in this assessment were compared against the cancer and HI criteria listed above. The results of this evaluation are summarized below.

11.0 RESULTS OF THE PRG-BASED HHRA

This section summarizes the results of the HHRA for the Site. The results of the PRG-based HHRA are summarized in Table A-8 for both current and future site configurations. Chemical-specific cancer risks and HIs are summarized in Attachment A2. Although not discussed in this appendix, Attachment A3 summarizes the results of a PRG-based HHRA using the maximum detected concentration.

For both the resident and the industrial worker under the current and future site configurations, the estimated cancer risks are either below or within the agency risk range of 10^{-4} to 10^{-6} for cancer risks. HIs exceed the threshold value of 1.0 only under the residential scenario at Buildings IA-20 and IA-36 (HI is equal to 2). Under the current site configuration for the Site, excluding samples in the perimeter of Buildings IA-20 and IA-36, an HI of 1.0 was estimated for the resident. For the entire site, the HI was below 1.0. The results associated with each of the areas are discussed in detail below.

11.1 PERIMETER OF BUILDINGS IA-20 AND IA-36

As noted above, soil samples at the perimeter of Buildings IA-20 and IA-36 were not collected below 0.5 foot bgs. For this reason, only a current site configuration evaluation was conducted for this area. For both the resident (3×10^{-5}) and the industrial worker (4×10^{-6}), cancer risk estimates for this area are within the EPA's risk range of 10^{-4} to 10^{-6} for cancer effects. The HI of 2 estimated for the resident exceeds EPA's threshold of 1 for non-cancer effects. Alpha- and gamma-chlordane accounted for approximately 87 percent of the total HI of 2. All industrial HIs are well below 1.0.

11.2 ENTIRE SITE EXCLUDING THE PERIMETER OF BUILDINGS IA-20 AND IA-36

11.2.1 Current Site Configuration

Current site configuration cancer risk estimates are 6 x 10^{-6} and 1 x 10^{-6} for the resident and the industrial worker, respectively. These estimates are within the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HI of 1 for the resident is equivalent to EPA's threshold of 1 for noncarcinogens. Aroclor 1248 and 1254 account for approximately 99 percent of the total HI of 1.0. The estimated HI of 0.08 for the industrial worker is well below EPA's threshold of 1.0.

11.2.2 Future Site Configuration

Cancer risk estimates are 2 x 10^{-6} and 4 x 10^{-7} for the resident and the industrial worker, respectively. These estimates are within the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.2 and 0.02 for the resident and the industrial worker receptor, respectively, are well below EPA's threshold of 1.0 for noncarcinogens.

11.3 ENTIRE SITE AREA

11.3.1 Current Site Configuration

Cancer risk estimates are 4 x 10^{-6} and 8 x 10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.6 and 0.05 for the resident and the industrial worker receptor, respectively, are well below EPA's threshold of 1.0 for noncarcinogens.

11.3.2 Future Site Configuration

Cancer risk estimates are 3 x 10^{-6} and 5 x 10^{-7} for the resident and the industrial worker, respectively. These estimates are within or below the EPA's risk range of 10^{-4} to 10^{-6} for carcinogens. The estimated HIs of 0.4 and 0.03 for the resident and the industrial worker receptor, respectively, are well below EPA's threshold of 1.0 for noncarcinogens.

12.0 UNCERTAINTY ANALYSIS

A number of uncertainties are inherent in the characterization of potential cancer risks and non-cancer health hazards presented in this document. Key uncertainties associated with the PRG-based HHRA conducted at the Site are discussed below.

12.1 DATA EVALUATION

To identify COPCs for the HHRA, the adequacy of site characterization data was reviewed, and a structured COPC selection process was employed. This section includes a discussion of uncertainties associated with data quality, the spatial coverage of data, the lack of metals and groundwater data, and the exclusion of composite soil samples from the HHRA data set.

12.1.1 Data Quality

Significant data quality issues were not identified in the analytical data used for the risk assessment. Completeness goals were met, and the validated analytical results provide data rated as "definitive" which is acceptable for use in risk assessment. Laboratory detection limits were generally adequate for identifying COPCs at concentrations within or below the EPA risk range for carcinogens. A detailed discussion is presented in the text below.

The potential impacts on the risk assessment of the relatively high DLs for some organic chemicals was assessed by comparing sample DLs to the residential PRGs for soil. The purpose of this comparison was to identify chemicals with DLs greater than their health-based PRG; such chemicals could be present at concentrations that represent a health risk even though they were reported as not detected. This comparison is shown in the table below, which lists all chemicals reported as not detected that had a DL greater than the residential PRG in one or more samples. For each chemical, the table shows the total number of samples analyzed; the PRG; the number of samples with DLs greater than the PRG, 2 times the PRG, and 10 times the PRG; and the range of DLs. A DL greater than 2 times the PRG corresponds to a hazard quotient greater than 2 (for noncarcinogens) and a cancer risk greater than 2×10^{-6} (for carcinogens); a DL greater than 10 times the PRG corresponds to a hazard quotient greater than 10 and a cancer risk greater than 1×10^{-5}. The information presented in Table A-9 is discussed below.

For 16 of the 36 chemicals listed in the table, the DLs were greater than the PRGs in only 3 or fewer of the 21 to 31 samples analyzed. That is, the chemical was detected or the DLs were less than their respective PRGs in the majority of the samples. For this group of chemicals, the few samples for which

DLs exceeded PRGs would not be expected to significantly affect the conclusions of the risk assessment and uncertainties associated with the presence or absence of the chemical at the site are considered low.

- **PAHs.** The DLs for two PAHs, benzo(a)pyrene and dibenz(a,h)anthracene, were greater than 2 times their PRGs in 19 of 21 samples, but were greater than 10 times the PRG in only 2 samples. If present at the reported DLs, the cancer risks for these two chemicals would range from 5×10^{-7} to 4×10^{-4}.

- **PCBs (Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260) -** The DLs for PCBs were greater than the PRG in up to 9 of 31 samples, but exceeded 10 times the PRG in only 3 samples. If present at the reported DLs, the cancer risks would range from 1×10^{-7} to 4×10^{-4}.

- **Pesticides and related chemicals.** Bis(2-chloroethyl)ether, dieldrin, hexachlorobenzene, and toxaphene are pesticides or chemicals used in the manufacture of pesticides; all are carcinogens. The DLs exceeded 2 times the PRG (corresponding to a cancer risk of 2×10^{-6}) in only 3 of the 19 or more samples analyzed for these chemicals, except for toxaphene. For toxaphene, DLs for 9 samples were greater than 2 times the PRG and 8 samples had DLs greater than 10 times the PRG (corresponding to a cancer risk of 1×10^{-5}). If present, cancer risks for toxaphene would range from 4×10^{-7} to 4×10^{-4}. However, toxaphene is used primarily to control insect pests on crops and livestock and to kill unwanted fish in lakes. Given these applications, it is unlikely that toxaphene was applied at Site 27.

- ***N*-Nitroso-di-n-propylamine.** The DLs for *N*-nitroso-di-n-propylamine were greater than the PRG in 19 of 21 samples. If present at the reported DLs, the cancer risks would range from 5×10^{-7} to 3×10^{-4}. However, *N*-nitroso-di-n-propylamine is produced primarily as a research chemical and is not used for commercial purposes. It is unlikely that this chemical is present at Site 27.

The above review indicates that health-based DLs were not met in all samples. However, for most chemicals, the elevated DLs are not expected to significantly affect the conclusions of the risk assessment and uncertainties associated with the possible presence or absence of the chemical at Site 27 are considered low. These conclusions are based on the following considerations:

- For some chemicals, DLs exceeded PRGs in only a small percentage of the total number of samples analyzed. The chemical was detected or the DLs were less than their respective PRGs in the majority of the samples analyzed. If a chemical was detected in one or more samples, it was selected as a COPC and evaluated in the risk assessment. Proxy concentrations of one-half the DL were used for all results reported as not detected.

- For several of the carcinogens, DLs exceeded PRGs by less than a factor of 2 in most samples, indicating that cancer risks associated with the DLs were 2×10^{-6} or less.

- For some chemicals, it is highly unlikely that the chemical is present at the site based on the known uses of the chemical and history of Site 27.

12.1.2 Data Coverage

The Site was sampled extensively during the IAS, SI, UST investigation, and RI. Both purposeful and random samples were collected. The data provide thorough spatial coverage and reduce uncertainty regarding the HHRA results. However, the majority of soil samples were collected at or near the surface. Historical uses of the site may suggest that chemical contamination is limited to the surface. COPCs such as PCBs and chlordane, bind readily to soil particles, inhibiting downward migration from surface soil locations. Additional sampling would be required for accurately establishing the nature and extent of contamination at depths below 4 feet bgs.

12.1.3 Excluding Metals from the Sampling Plan

As indicated in Section 5.1, soil samples were not analyzed for the presence of metals. Historical uses of the Site suggest no basis for anthropogenic sources of metals at the Site. The lack of metals data does, however, preclude confirmation of the historical records.

12.1.4 Excluding Composite Soil Samples from the Assessment

As indicated in Section 5.2, CSS were excluded from the PRG-based HHRA for the following reasons:

- They do not represent a single location.
- Chemical concentrations detected in these samples were lower than those detected in at least one other sample location used in the assessment.

VOCs were only detected in composite soil samples. However, as indicated in Section 5.2, VOCs were only detected at very low concentrations - between one and over six orders of magnitude below the residential PRG. Additionally three of the VOCs (2-butanone, acetone, and methylene chloride) are common laboratory contaminants (that is, not site related). Exclusion of the composite soil samples has a minimal impact on the results of the PRG-based HHRA and has likely resulted in slight under estimation of cancer risks and HIs at the Site.

12.1.5 Excluding Groundwater as a Potential Source of Contamination

As noted earlier in Section 5.0, potential health impacts associated with exposure to COPCs in groundwater were not evaluated because groundwater impacts are not expected at the Site. Factors considered include historical uses of the Site and the physical and chemical properties of the COPCs (PCBs and pesticides bind tightly to soil). Based on this information, potential impacts associated with groundwater exposure appear unlikely or minor. Estimated cancer risks and HIs for Site 27 may have resulted in an underestimate of cancer risks and HIs if the groundwater is significantly impacted by COPCs.

12.2 EXPOSURE ASSESSMENT

Uncertainties were identified in association with the identification of receptors and are discussed below. Receptors and exposure scenarios are identified based on observed and assumed land use and activity patterns of the current and future receptors. The actual land use and activity patterns at the site are not identical to those used to develop the PRGs, thereby introducing uncertainties. For example, future land use is assumed to be residential for the Site; however, future land use is not expected to change from its current use as an operational naval base. Evaluation of impacts to a resident has likely resulted in an overestimate of cancer risks and HIs at the Site.

12.3 FATE AND TRANSPORT MODELING

PRGs do not account for exposure to chemical vapors while indoors (Section 7.3). No VOCs were detected in the samples used to conduct the PRG-based HHRA (Tables A-2 through A-6). As noted in Sections 5.0 and 12.0, the VOCs detected in the excluded composite soil samples are all below residential PRGs; in the case of acetone and 2-butanone, they are considered common laboratory contaminants. As a result**,** impacts associated with exposure to COPC vapors are also likely to be minimal. Exclusion of exposure to COPC vapors indoors may result in a very slight underestimate of cancer risks and HIs at the Site.

12.4 ESTIMATING EXPOSURE POINT CONCENTRATIONS

As discussed in Section 9.0, the UCL_{95} was used as the exposure point, as recommended by EPA when evaluating RME conditions. Conditions across the Site will typically be lower than the UCL_{95}. As a result, the EPCs based on the maximum concentration or the UCL_{95} are likely to overestimate the concentrations and associated cancer risks and HIs at the Site.

12.5 TOXICITY ASSESSMENT

The primary uncertainties associated with the toxicity assessment are related to development of toxicity values for COPCs. Standard toxicity values (RfDs and SFs) were used by EPA Region 9 to develop the PRGs used in this HHRA.

The cancer risks and non-cancer health hazards can be assessed only for those COPCs for which the relevant toxicity values (and therefore PRGs) are available. For COPCs for which an SF or RfD was available for only one route of exposure, route-to-route extrapolations were made in the derivation of the Region 9 PRGs. These extrapolations will introduce some uncertainty into the risk and hazard estimates. The impacts likely result in the overestimate of cancer risks and HIs for the Site.

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FIGURES

Figure A-1

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

TABLES

TABLE A-1
POINT AND SAMPLE IDENTIFICATIONS USED
PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT ID	SAMPLE ID
MTLSB010	303MTLSS012
MTLSB011	303MTLSS108
MTLSB012	303MTLSS101
MTLSB013	303MTLSS102
MTLSB014	303MTLSS104
MTLSB015	303MTLSS103
MTLSB016	303MTLSS013
MTLSB017	303MTLSS105
MTLSB018	303MTLSS106
MTLSB019	303MTLSS107
MTLSB020	303MTLSS109
MTLSB021	303MTLSS110
MTLSB022	303MTLSS111
MTLSB023	303MTLSS001
MTLSB023	303MTLSS002
MTLSB024	303MTLSS003
MTLSB024	303MTLSS004
MTLSB025	303MTLSS005
MTLSB025	303MTLSS006

Notes:
Point IDs are all listed on Figure A-1.

ID	Identification number
PRG	Preliminary remediation goal

TABLE A-2
STATISTICAL SUMMARY OF ALL CHEMICALS DETECTED IN SOIL AT BUILDINGS IA-20 AND IA-36
0 TO 0.5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical of Potential Concern	Frequency of Detection	Maximum Concentration	Minimum Concentration	Arithmetic Mean	UCL_{95}[a]	RME Concentration	Distribution
Semivolatile Organic Compound (mg/kg)							
4-Nitroaniline	1/4	0.15	0.15	3.50	10.95	0.15	Not tested
Benzo(b)fluoranthene	1/4	0.02	0.02	1.47	4.63	0.02	Not tested
Benzo(g,h,i)perylene	1/4	0.04	0.04	1.47	4.63	0.04	Not tested
Chrysene	2/4	0.03	0.02	1.43	4.62	0.03	Not tested
Fluoranthene	1/4	0.04	0.04	1.47	4.63	0.04	Not tested
Indeno(1,2,3-cd)pyrene	1/4	0.02	0.02	1.47	4.63	0.02	Not tested
Pentachlorophenol	1/4	0.08	0.08	3.49	10.95	0.08	Not tested
Pyrene	1/4	0.03	0.03	1.47	4.63	0.03	Not tested
Pesticide (mg/kg)							
4,4'-DDD	2/4	8.20	2.00	3.03	7.23	7.23	Not tested
Alpha-chlordane	4/4	24.00	0.02	10.33	22.79	22.79	Normal
Gamma-chlordane	4/4	23.00	0.02	9.83	21.69	21.69	Normal

Notes:

DDD	Dichlorodiphenyldichloroethane
mg/kg	Milligram per kilogram
RME	Reasonable maximum exposure
UCL_{95}	95th percent upper confidence limit on the arithmetic mean
a	When the UCL_{95} is greater than the maximum, the RME concentrations was based on the maximum.

TABLE A-3
STATISTICAL SUMMARY OF ALL CHEMICALS DETECTED IN SOIL AT SITE 27 EXCLUDING BUILDINGS IA-20 AND IA-36
0 TO 0.5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical of Potential Concern	Frequency of Detection	Maximum Concentration	Minimum Concentration	Arithmetic Mean	UCL_{95}[a]	RME Concentration	Distribution
Semivolatile Organic Compound (mg/kg)							
Benzo(a)anthracene	1/12	0.03	0.03	1.10	2.80	0.03	Not tested
Benzo(a)pyrene	1/12	0.02	0.02	1.10	2.80	0.02	Not tested
Benzo(b)fluoranthene	1/12	0.02	0.02	1.10	2.80	0.02	Not tested
Benzo(g,h,i)perylene	1/12	0.03	0.03	1.10	2.80	0.03	Not tested
Benzo(k)fluoranthene	1/12	0.02	0.02	1.10	2.80	0.02	Not tested
Chrysene	1/12	0.03	0.03	1.10	2.80	0.03	Not tested
Fluoranthene	1/12	0.03	0.03	1.10	2.80	0.03	Not tested
Phenol	2/12	0.38	0.27	1.12	2.82	0.38	Not tested
Pyrene	1/12	0.02	0.02	1.10	2.80	0.02	Not tested
Pesticide (mg/kg)							
4,4'-DDD	2/12	0.06	0.05	0.01	0.02	0.02	Not tested
4,4'-DDE	1/12	0.03	0.03	0.01	0.01	0.01	Not tested
4,4'-DDT	1/12	0.01	0.01	0.01	0.01	0.01	Not tested
Alpha-chlordane	8/12	0.10	0.001	0.02	0.24	0.10	Lognormal
Aroclor 1248	5/12	0.50	0.04	0.13	0.18	0.18	Non Parametric
Aroclor 1254	5/12	1.00	0.12	0.23	1.20	1.00	Lognormal
Dieldrin	1/12	0.01	0.01	0.01	0.01	0.01	Not tested
Endosulfan I	1/12	0.02	0.02	0.004	0.01	0.01	Not tested
Gamma-chlordane	6/12	0.10	0.001	0.01	0.005	0.005	Non Parametric

Notes:

DDD	Dichlorodiphenyldichloroethane	RME	Reasonable maximum exposure
DDE	Dichlorodiphenyldichloroethene	UCL_{95}	95 percent upper confidence limit on the arithmetic mean
DDT	Dichlorodiphenyltrichloroethane		
mg/kg	Milligram per kilogram		

a When the UCL_{95} is greater than the maximum, the RME concentration was based on the maximum.

TABLE A-4
STATISTICAL SUMMARY OF ALL CHEMICALS DETECTED IN SOIL AT SITE 27 EXCLUDING BUILDINGS IA-20 AND IA-36
0 TO 4 FEET BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SBD CONCORD

Chemical of Potential Concern	Frequency of Detection	Maximum Concentration	Minimum Concentration	Arithmetic Mean	UCL_{95}[a]	RME Concentration	Distribution
Semivolatile Organic Compound (mg/kg)							
Benzo(a)anthracene	1/15	0.03	0.03	0.92	2.25	0.03	Not tested
Benzo(a)pyrene	1/15	0.02	0.02	0.92	2.25	0.02	Not tested
Benzo(b)fluoranthene	1/15	0.02	0.02	0.92	2.25	0.02	Not tested
Benzo(g,h,i)perylene	1/15	0.03	0.03	0.92	2.25	0.03	Not tested
Benzo(k)fluoranthene	1/15	0.02	0.02	0.92	2.25	0.02	Not tested
Chrysene	1/15	0.03	0.03	0.92	2.25	0.03	Not tested
Fluoranthene	1/15	0.03	0.03	0.92	2.25	0.03	Not tested
Phenol	2/15	0.38	0.27	0.94	2.27	0.38	Not tested
Pyrene	1/15	0.02	0.02	0.92	2.25	0.02	Not tested
Pesticide (mg/kg)							
4,4'-DDD	2/15	0.06	0.05	0.01	0.02	0.02	Not tested
4,4'-DDE	1/15	0.03	0.03	0.01	0.01	0.01	Not tested
4,4'-DDT	1/15	0.01	0.01	0.005	0.01	0.01	Not tested
Alpha-chlordane	8/15	0.10	0.001	0.02	0.01	0.01	Non Parametric
Aroclor 1248	6/15	0.50	0.04	0.11	0.11	0.11	Non Parametric
Aroclor 1254	5/15	1.00	0.12	0.16	0.14	0.14	Non Parametric
Dieldrin	1/15	0.01	0.01	0.005	0.01	0.01	Not tested
Endosulfan I	1/15	0.02	0.02	0.004	0.01	0.01	Not tested
Gamma-chlordane	6/15	0.10	0.001	0.01	0.003	0.003	Non Parametric

Notes:

DDD	Dichlorodiphenyldichloroethane	RME	Reasonable maximum exposure
DDE	Dichlorodiphenyldichloroethene	UCL_{95}	95 percent upper confidence limit on the arithmetic mean
DDT	Dichlorodiphenyltrichloroethane		
mg/kg	Milligram per kilogram		

a When the UCL_{95} is greater than the maximum, the RME concentration was based on the maximum.

TABLE A-5
STATISTICAL SUMMARY OF ALL CHEMICALS DETECTED IN SOIL AT THE ENTIRE SITE 27 AREA
0 TO 0 . 5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical of Potential Concern	Frequency of Detection	Maximum Concentration	Minimum Concentration	Arithmetic Mean	UCL_{95}[a]	RME Concentration	Distribution
Semivolatile Organic Compound (mg/kg)							
4-Nitroaniline	1/16	0.15	0.15	2.95	6.29	0.15	Not tested
Benzo(a)anthracene	1/16	0.03	0.03	1.20	2.54	0.03	Not tested
Benzo(a)pyrene	1/16	0.02	0.02	1.20	2.54	0.02	Not tested
Benzo(b)fluoranthene	2/16	0.02	0.02	1.19	2.53	0.02	Not tested
Benzo(g,h,i)perylene	2/16	0.04	0.03	1.19	2.53	0.04	Not tested
Benzo(k)fluoranthene	1/16	0.02	0.02	1.20	2.54	0.02	Not tested
Chrysene	3/16	0.03	0.02	1.18	2.52	0.03	Not tested
Fluoranthene	2/16	0.04	0.03	1.19	2.53	0.04	Not tested
Indeno(1,2,3-cd)pyrene	1/16	0.02	0.02	1.19	2.53	0.02	Not tested
Pentachlorophenol	1/16	0.08	0.08	2.94	6.29	0.08	Not tested
Phenol	2/16	0.38	0.27	1.22	2.56	0.38	Not tested
Pyrene	2/16	0.03	0.02	1.19	2.53	0.03	Not tested
Pesticide (mg/kg)							
4,4'-DDD	4/16	8.20	0.05	0.77	0.02	0.02	Non Parametric
4,4'-DDE	1/16	0.03	0.03	0.20	0.43	0.03	Not tested
4,4'-DDT	1/16	0.01	0.01	0.20	0.42	0.01	Not tested
Alpha-chlordane	12/16	24.00	0.00	2.60	0.05	0.05	Non Parametric
Aroclor-1248	5/16	0.50	0.04	2.07	0.27	0.27	Non Parametric
Aroclor-1254	5/16	1.00	0.12	2.12	0.35	0.35	Non Parametric
Dieldrin	1/16	0.01	0.01	0.20	0.42	0.01	Not tested
Endosulfan I	1/16	0.02	0.02	0.10	0.21	0.02	Not tested
Gamma-chlordane	10/16	23.00	0.001	2.47	0.03	0.03	Non Parametric

Notes:

DDD	Dichlorodiphenyldichloroethane	RME	Reasonable maximum exposure
DDE	Dichlorodiphenyldichloroethene	UCL_{95}	95 percent upper confidence limit on the arithmetic mean
DDT	Dichlorodiphenyltrichloroethane		
mg/kg	Milligram per kilogram		
a	When the UCL_{95} is greater than the maximum, the RME concentration was based on the maximum.		

TABLE A-6
STATISTICAL SUMMARY OF ALL CHEMICALS DETECTED IN SOIL AT THE ENTIRE SITE 27 AREA
0 TO 4 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical of Potential Concern	Frequency of Detection	Maximum Concentration	Minimum Concentration	Arithmetic Mean	UCL_{95}[a]	RME Concentration	Distribution
Semivolatile Organic Compound (mg/kg)							
4-Nitroaniline	1/19	0.15	0.15	2.56	5.35	0.15	Not tested
Benzo(a)anthracene	1/19	0.03	0.03	1.04	2.16	0.03	Not tested
Benzo(a)pyrene	1/19	0.02	0.02	1.04	2.16	0.02	Not tested
Benzo(b)fluoranthene	2/19	0.02	0.02	1.04	2.15	0.02	Not tested
Benzo(g,h,i)perylene	2/19	0.04	0.03	1.04	2.16	0.04	Not tested
Benzo(k)fluoranthene	1/19	0.02	0.02	1.04	2.16	0.02	Not tested
Chrysene	3/19	0.03	0.02	1.03	2.15	0.03	Not tested
Fluoranthene	2/19	0.04	0.03	1.04	2.16	0.04	Not tested
Indeno(1,2,3-cd)pyrene	1/19	0.02	0.02	1.03	2.15	0.02	Not tested
Pentachlorophenol	1/19	0.08	0.08	2.56	5.35	0.08	Not tested
Phenol	2/19	0.38	0.27	1.06	2.17	0.38	Not tested
Pyrene	2/19	0.03	0.02	1.04	2.16	0.03	Not tested
Pesticide (mg/kg)							
4,4'-DDD	4/19	8.20	0.05	0.64	0.01	0.01	Non Parametric
4,4'-DDE	1/19	0.03	0.03	0.17	0.36	0.03	Not tested
4,4'-DDT	1/19	0.01	0.01	0.17	0.36	0.01	Not tested
Alpha-chlordane	12/19	24.00	0.001	2.19	0.02	0.02	Non Parametric
Aroclor-1248	6/19	0.50	0.04	1.75	0.18	0.18	Non Parametric
Aroclor-1254	5/19	1.00	0.12	1.79	0.20	0.20	Non Parametric
Dieldrin	1/19	0.01	0.01	0.17	0.36	0.01	Not tested
Endosulfan I	1/19	0.02	0.02	0.09	0.18	0.02	Not tested
Gamma-chlordane	10/19	23.00	0.001	2.08	0.02	0.02	Non Parametric

Notes:

DDD Dichlorodiphenyldichloroethane

DDE Dichlorodiphenyldichloroethene

DDT Dichlorodiphenyltrichloroethane

mg/kg Milligram per kilogram

RME Reasonable maximum exposure

UCL_{95} 95 percent upper confidence limit on the arithmetic mean

a When the UCL_{95} is greater than the maximum, the RME concentration was based on the maximum.

TABLE A-7
PRELIMINARY REMEDIATION GOALS AND SURROGATE CHEMICALS USED
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical of Potential Concern	Surrogate	RESIDENTIAL PRGS		INDUSTRIAL PRGS		Comments
		Cancer	Non-cancer	Cancer	Non-cancer	
Semivolatile Organic Compound						
4-Nitroaniline	2-Nitroaniline	--	3.5	--	50	
Benzo(a)anthracene	Anthracene	0.62	22000	2.9	100000	
Benzo(a)pyrene	Pyrene	0.062	2300	0.29	54000	
Benzo(b)fluoranthene	Fluoranthene	0.62	2300	2.9	30000	
Benzo(g,h,i)perylene	Pyrene	--	2300	--	54000	
Benzo(k)fluoranthene	Fluoranthene	0.61	2300	29	30000	Cal/EPA modified PRG
Chrysene	Anthracene	6.1	22000	290	100000	Cal/EPA modified PRG
Fluoranthene	NA	--	2300	--	30000	
Indeno(1,2,3-cd)pyrene	Fluoranthene	0.62	2300	2.9	30000	
Pentachlorophenol	NA	3	1400	11	14000	
Phenol	NA	--	37000	--	100000	The NC industrial PRG was based on a nontoxicity-based "ceiling limit."
Pyrene	NA	--	2300	--	54000	
Pesticides						
4,4'-DDD	PRG for DDT used to evaluate NC effects	2.4	36	17	730	
4,4'-DDE	PRG for DDT used to evaluate NC effects	1.7	36	12	730	
4,4'-DDT	NA	1.7	36	12	730	
Alpha-chlordane	Chlordane	1.6	35	11	670	
Aroclor 1248	PRG for Aroclor-1254 used to evaluate NC effects	0.22	1.1	1	14	
Aroclor 1254	NA	0.22	1.1	1	14	
Dieldrin	NA	0.03	3.1	0.15	44	
Endosulfan I	NA	--	370	--	5300	
Gamma-chlordane	Chlordane	1.6	35	11	670	

Notes:

--	Value not estimated based on unavailable PRGs	DDT	Dichlorodiphenyltrichloroethane
Cal/EPA	California Environmental Protection Agency	NA	Not applicable
DDD	Dichlorodiphenyldichloroethane	NC	Non-cancer
DDE	Dichlorodiphenyldichloroethene	PRG	Preliminary remediation goal

TABLE A-8
SUMMARY OF RESULTS OF THE PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
REASONABLE MAXIMUM EXPOSURE SCENARIO
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

	Residential		**Industrial**	
Current Site Conditions[a]	**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
Buildings IA-20 and IA-36[b]	3.E-05	**2**[c]	4.E-06	0.08
Site 27 Excluding the Buildings IA-20 and IA-36	6.E-06	1[d]	1.E-06	0.08
Entire Site 27 Area	4.E-06	0.6	8.E-07	0.05
Future Site Conditions[e]				
Buildings IA-20 and IA-36[b]	- -[f]	- -	- -	- -
Site 27 Excluding the Buildings IA-20 and IA-36	2.E-06	0.2	4.E-07	0.02
Entire Site 27 Area	2.5.E-06	0.4	5.E-07	0.03

Notes:

For all evaluations of the Site, composite soil samples were excluded from evaluation (Section A5.2).

a Current site conditions were evaluated using soil data collected from 0 to 0.5 feet below ground surface.

b Soil samples MTLSB014, MTLSB017, MTLSB018, and MTLSB019 were used to evaluate chemical impacts at the perimeter of Buildings IA-20 and IA-36.

c Alpha- and gamma-chlordane account for approximately 87 percent of the total hazard index of 2.

d Aroclor 1248 and 1254 account for approximately 99 percent of the total hazard index of 1.

e Future site conditions were evaluated using soil data collected at all available depths (that is, down to 4 feet below ground surface).

f Soil samples were not collected beyond 0.5 foot below ground surface at Buildings IA-20 and IA-36. For this reason, impacts associated with future site conditions could not be quantified.

TABLE A-9
ANALYTES WITH DETECTION LIMITS EXCEEDING THE RESIDENTIAL PRELIMINARY REMEDIATION GOAL
PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Analyte	Number of Samples Analyzed	Residential PRG (mg/kg)	Number of Samples with Detection Limits			Toxicity	Range of Detection Limits (mg/kg)
			> Residential PRG	> 2 x Residential PRG	> 10 x Residential PRG		
1,3-Dichlorobenzene	21	13.23669	1	0	0	c	0.033 – 23
1,4-Dichlorobenzene	21	3.44418	2	2	0	c	0.033 – 23
2,2'-Oxybis(1-Chloropropane)	21	2.88422	2	2	0	c	0.033 – 23
2-Nitroaniline	21	3.49161	2	2	1	nc	0.083 – 58
3,3'-Dichlorobenzidine	21	1.08085	2	2	2	c	0.033 – 23
4,4'-DDD	28	2.4	2	0	0	c	0.0034 - 3.8
4,4'-DDE	30	1.7	2	1	0	c	0.0034 - 3.8
4,4'-DDT	28	1.7	2	1	0	c	0.0034 - 3.8
Aldrin	31	0.029	3	3	3	c	0.0017 - 1.9
Alpha-BHC	31	0.09	3	3	2	c	0.0017 - 1.9
Aroclor-1016	31	0.22185	6	3	3	c	0.03 – 38
Aroclor-1221	31	0.22185	9	6	3	c	0.069 – 76
Aroclor-1232	31	0.22185	6	3	3	c	0.034 - 38
Aroclor-1242	31	0.22	6	3	3	c	0.034 - 38
Aroclor-1248	30	0.22	8	3	3	c	0.033 - 38
Aroclor-1254	31	0.22	9	3	3	c	0.033 - 38
Aroclor-1260	31	0.22	6	3	3	c	0.034 - 38
Benzo(a)anthracene	21	0.62	2	1	1	c	0.033 - 23
Benzo(a)pyrene	21	0.062	19	19	2	c	0.033 - 23
Benzo(b)fluoranthene	21	0.62	2	2	2	c	0.033 - 23
Benzo(k)fluoranthene	21	0.61	2	2	2	c	0.033 - 23

TABLE A-9 (Continued)
ANALYTES WITH DETECTION LIMITS EXCEEDING THE RESIDENTIAL PRELIMINARY REMEDIATION GOAL
PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Analyte	Number of Samples Analyzed	Residential PRG (mg/kg)	Number of Samples with Detection Limits			Toxicity	Range of Detection Limits (mg/kg)
			> Residential PRG	> 2 x Residential PRG	> 10 x Residential PRG		
Beta-BHC	31	0.32	3	2	0	c	0.0017 - 1.9
Bis(2-Chloroethyl)Ether	21	0.21089	19	2	2	c	0.033 - 23
Delta-BHC	31	0.43719	2	2	0	c	0.0017 - 1.9
Dibenz(a,h)anthracene	21	0.06214	19	19	2	c	0.033 - 23
Dieldrin	30	0.03	6	3	3	c	0.003 - 3.8
Gamma-BHC (Lindane)	31	0.44	2	2	0	c	0.0017 - 1.9
Heptachlor	31	0.11	3	3	1	c	0.0017 - 1.9
Heptachlor Epoxide	31	0.053	3	3	2	c	0.0017 - 1.9
Hexachlorobenzene	21	0.3	19	2	2	c	0.033 - 23
Hexachlorobutadiene	21	6.2356476	2	1	0	c	0.033 - 23
Indeno(1,2,3-cd)pyrene	21	0.62	2	2	2	c	0.033 - 23
N-nitroso-di-n-propylamine	21	0.06948	19	19	2	c	0.033 - 23
Nitrobenzene	21	19.6412	1	0	0	c	0.033 - 23
Pentachlorophenol	21	3	2	2	1	c	0.083 - 58
Toxaphene	31	0.44216	9	8	3	c	0.17 - 190

Notes:

BHC	Hexachlorocyclohexane	DDT	Dichlorodiphenyltrichloroethane
c	Carcinogen	mg/kg	Milligram per kilogram
DDD	Dichlorodiphenyldichloroethane	nc	Noncarcinogen
DDE	Dichlorodiphenyldichloroethene	PRG	Preliminary remediation goal

ATTACHMENT A1

DATA USED TO CONDUCT THE PRG-BASED HUMAN HEALTH RISK ASSESSMENT

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB010	303MTLSS012	4,4'-DDD	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	4,4'-DDE	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	4,4'-DDT	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	ALDRIN	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	ALPHA-BHC	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	ALPHA-CHLORDANE	10-May-95	0	0.5	0.012	MG/KG	
MTLSB010	303MTLSS012	AROCLOR-1016	10-May-95	0	0.5	0.17	MG/KG	U
MTLSB010	303MTLSS012	AROCLOR-1221	10-May-95	0	0.5	0.34	MG/KG	U
MTLSB010	303MTLSS012	AROCLOR-1232	10-May-95	0	0.5	0.17	MG/KG	U
MTLSB010	303MTLSS012	AROCLOR-1242	10-May-95	0	0.5	0.17	MG/KG	U
MTLSB010	303MTLSS012	AROCLOR-1248	10-May-95	0	0.5	0.39	MG/KG	
MTLSB010	303MTLSS012	AROCLOR-1254	10-May-95	0	0.5	0.45	MG/KG	
MTLSB010	303MTLSS012	AROCLOR-1260	10-May-95	0	0.5	0.17	MG/KG	U
MTLSB010	303MTLSS012	BETA-BHC	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	DELTA-BHC	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	DIELDRIN	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	DIESEL RANGE ORGANICS	10-May-95	0	0.5	100	MG/KG	UJ
MTLSB010	303MTLSS012	ENDOSULFAN I	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	ENDOSULFAN II	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	ENDOSULFAN SULFATE	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	ENDRIN	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	ENDRIN ALDEHYDE	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	ENDRIN KETONE	10-May-95	0	0.5	0.017	MG/KG	U
MTLSB010	303MTLSS012	GAMMA-BHC (LINDANE)	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	GAMMA-CHLORDANE	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	HEPTACHLOR	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	HEPTACHLOR EPOXIDE	10-May-95	0	0.5	0.0084	MG/KG	U
MTLSB010	303MTLSS012	METHOXYCHLOR	10-May-95	0	0.5	0.084	MG/KG	U
MTLSB010	303MTLSS012	MOTOR OIL RANGE ORGANICS	10-May-95	0	0.5	700	MG/KG	J
MTLSB010	303MTLSS012	TOXAPHENE	10-May-95	0	0.5	0.84	MG/KG	U
MTLSB011	303MTLSS108	4,4'-DDD	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	4,4'-DDE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	4,4'-DDT	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	ALDRIN	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	ALPHA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	ALPHA-CHLORDANE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	AROCLOR-1016	11-May-95	0	0.5	0.038	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB011	303MTLSS108	AROCLOR-1221	11-May-95	0	0.5	0.076	MG/KG	U
MTLSB011	303MTLSS108	AROCLOR-1232	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB011	303MTLSS108	AROCLOR-1242	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB011	303MTLSS108	AROCLOR-1248	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB011	303MTLSS108	AROCLOR-1254	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB011	303MTLSS108	AROCLOR-1260	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB011	303MTLSS108	BETA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	DELTA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	DIELDRIN	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	DIESEL RANGE ORGANICS	11-May-95	0	0.5	11	MG/KG	U
MTLSB011	303MTLSS108	ENDOSULFAN I	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	ENDOSULFAN II	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	ENDRIN	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	ENDRIN KETONE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB011	303MTLSS108	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	GAMMA-CHLORDANE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	HEPTACHLOR	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB011	303MTLSS108	METHOXYCHLOR	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB011	303MTLSS108	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	38	MG/KG	
MTLSB011	303MTLSS108	TOXAPHENE	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	4,4'-DDD	11-May-95	0	0.5	0.058	MG/KG	
MTLSB012	303MTLSS101	4,4'-DDE	11-May-95	0	0.5	0.031	MG/KG	
MTLSB012	303MTLSS101	4,4'-DDT	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	ALDRIN	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	ALPHA-BHC	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	ALPHA-CHLORDANE	11-May-95	0	0.5	0.045	MG/KG	
MTLSB012	303MTLSS101	AROCLOR-1016	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	AROCLOR-1221	11-May-95	0	0.5	0.37	MG/KG	U
MTLSB012	303MTLSS101	AROCLOR-1232	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	AROCLOR-1242	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	AROCLOR-1248	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	AROCLOR-1254	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	AROCLOR-1260	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB012	303MTLSS101	BETA-BHC	11-May-95	0	0.5	0.0093	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB012	303MTLSS101	DELTA-BHC	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	DIELDRIN	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	DIESEL RANGE ORGANICS	11-May-95	0	0.5	11	MG/KG	U
MTLSB012	303MTLSS101	ENDOSULFAN I	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	ENDOSULFAN II	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	ENDRIN	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	ENDRIN KETONE	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB012	303MTLSS101	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	GAMMA-CHLORDANE	11-May-95	0	0.5	0.035	MG/KG	
MTLSB012	303MTLSS101	HEPTACHLOR	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0093	MG/KG	U
MTLSB012	303MTLSS101	METHOXYCHLOR	11-May-95	0	0.5	0.093	MG/KG	U
MTLSB012	303MTLSS101	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	77	MG/KG	
MTLSB012	303MTLSS101	TOXAPHENE	11-May-95	0	0.5	0.93	MG/KG	U
MTLSB013	303MTLSS102	4,4'-DDD	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	4,4'-DDE	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	4,4'-DDT	11-May-95	0	0.5	0.014	MG/KG	J
MTLSB013	303MTLSS102	ALDRIN	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	ALPHA-BHC	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	ALPHA-CHLORDANE	11-May-95	0	0.5	0.049	MG/KG	
MTLSB013	303MTLSS102	AROCLOR-1016	11-May-95	0	0.5	0.18	MG/KG	U
MTLSB013	303MTLSS102	AROCLOR-1221	11-May-95	0	0.5	0.36	MG/KG	U
MTLSB013	303MTLSS102	AROCLOR-1232	11-May-95	0	0.5	0.18	MG/KG	U
MTLSB013	303MTLSS102	AROCLOR-1242	11-May-95	0	0.5	0.18	MG/KG	U
MTLSB013	303MTLSS102	AROCLOR-1248	11-May-95	0	0.5	0.5	MG/KG	
MTLSB013	303MTLSS102	AROCLOR-1254	11-May-95	0	0.5	1	MG/KG	
MTLSB013	303MTLSS102	AROCLOR-1260	11-May-95	0	0.5	0.18	MG/KG	U
MTLSB013	303MTLSS102	BETA-BHC	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	DELTA-BHC	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	DIELDRIN	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	DIESEL RANGE ORGANICS	11-May-95	0	0.5	11	MG/KG	U
MTLSB013	303MTLSS102	ENDOSULFAN I	11-May-95	0	0.5	0.024	MG/KG	
MTLSB013	303MTLSS102	ENDOSULFAN II	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	ENDRIN	11-May-95	0	0.5	0.018	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB013	303MTLSS102	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	ENDRIN KETONE	11-May-95	0	0.5	0.018	MG/KG	U
MTLSB013	303MTLSS102	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	GAMMA-CHLORDANE	11-May-95	0	0.5	0.021	MG/KG	
MTLSB013	303MTLSS102	HEPTACHLOR	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0091	MG/KG	U
MTLSB013	303MTLSS102	METHOXYCHLOR	11-May-95	0	0.5	0.091	MG/KG	U
MTLSB013	303MTLSS102	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	40	MG/KG	
MTLSB013	303MTLSS102	TOXAPHENE	11-May-95	0	0.5	0.91	MG/KG	U
MTLSB014	303MTLSS104	4,4'-DDD	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	4,4'-DDE	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	4,4'-DDT	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	ALDRIN	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	ALPHA-BHC	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	ALPHA-CHLORDANE	11-May-95	0	0.5	24	MG/KG	
MTLSB014	303MTLSS104	AROCLOR-1016	11-May-95	0	0.5	38	MG/KG	U
MTLSB014	303MTLSS104	AROCLOR-1221	11-May-95	0	0.5	76	MG/KG	U
MTLSB014	303MTLSS104	AROCLOR-1232	11-May-95	0	0.5	38	MG/KG	U
MTLSB014	303MTLSS104	AROCLOR-1242	11-May-95	0	0.5	38	MG/KG	U
MTLSB014	303MTLSS104	AROCLOR-1248	11-May-95	0	0.5	38	MG/KG	U
MTLSB014	303MTLSS104	AROCLOR-1254	11-May-95	0	0.5	38	MG/KG	U
MTLSB014	303MTLSS104	AROCLOR-1260	11-May-95	0	0.5	38	MG/KG	U
MTLSB014	303MTLSS104	BETA-BHC	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	DELTA-BHC	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	DIELDRIN	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	DIESEL RANGE ORGANICS	11-May-95	0	0.5	56	MG/KG	U
MTLSB014	303MTLSS104	ENDOSULFAN I	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	ENDOSULFAN II	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	ENDOSULFAN SULFATE	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	ENDRIN	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	ENDRIN ALDEHYDE	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	ENDRIN KETONE	11-May-95	0	0.5	3.8	MG/KG	U
MTLSB014	303MTLSS104	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	GAMMA-CHLORDANE	11-May-95	0	0.5	23	MG/KG	
MTLSB014	303MTLSS104	HEPTACHLOR	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB014	303MTLSS104	METHOXYCHLOR	11-May-95	0	0.5	19	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB014	303MTLSS104	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	630	MG/KG	
MTLSB014	303MTLSS104	TOXAPHENE	11-May-95	0	0.5	190	MG/KG	U
MTLSB015	303MTLSS103	4,4'-DDD	11-May-95	0	0.5	0.05	MG/KG	
MTLSB015	303MTLSS103	4,4'-DDE	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	4,4'-DDT	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	ALDRIN	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	ALPHA-BHC	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	ALPHA-CHLORDANE	11-May-95	0	0.5	0.1	MG/KG	
MTLSB015	303MTLSS103	AROCLOR-1016	11-May-95	0	0.5	0.39	MG/KG	U
MTLSB015	303MTLSS103	AROCLOR-1221	11-May-95	0	0.5	0.78	MG/KG	U
MTLSB015	303MTLSS103	AROCLOR-1232	11-May-95	0	0.5	0.39	MG/KG	U
MTLSB015	303MTLSS103	AROCLOR-1242	11-May-95	0	0.5	0.39	MG/KG	U
MTLSB015	303MTLSS103	AROCLOR-1248	11-May-95	0	0.5	0.39	MG/KG	U
MTLSB015	303MTLSS103	AROCLOR-1254	11-May-95	0	0.5	0.39	MG/KG	U
MTLSB015	303MTLSS103	AROCLOR-1260	11-May-95	0	0.5	0.39	MG/KG	U
MTLSB015	303MTLSS103	BETA-BHC	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	DELTA-BHC	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	DIELDRIN	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	DIESEL RANGE ORGANICS	11-May-95	0	0.5	2700	MG/KG	
MTLSB015	303MTLSS103	ENDOSULFAN I	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	ENDOSULFAN II	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	ENDRIN	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	ENDRIN KETONE	11-May-95	0	0.5	0.039	MG/KG	U
MTLSB015	303MTLSS103	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	GAMMA-CHLORDANE	11-May-95	0	0.5	0.1	MG/KG	
MTLSB015	303MTLSS103	HEPTACHLOR	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB015	303MTLSS103	METHOXYCHLOR	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB015	303MTLSS103	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	7400	MG/KG	
MTLSB015	303MTLSS103	TOXAPHENE	11-May-95	0	0.5	1.9	MG/KG	U
MTLSB016	303MTLSS013	4,4'-DDD	10-May-95	0	0.5	0.004	MG/KG	U
MTLSB016	303MTLSS013	4,4'-DDE	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	4,4'-DDT	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	ALDRIN	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	ALPHA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB016	303MTLSS013	ALPHA-CHLORDANE	10-May-95	0	0.5	0.0014	MG/KG	J
MTLSB016	303MTLSS013	AROCLOR-1016	10-May-95	0	0.5	0.038	MG/KG	U
MTLSB016	303MTLSS013	AROCLOR-1221	10-May-95	0	0.5	0.076	MG/KG	U
MTLSB016	303MTLSS013	AROCLOR-1232	10-May-95	0	0.5	0.038	MG/KG	U
MTLSB016	303MTLSS013	AROCLOR-1242	10-May-95	0	0.5	0.038	MG/KG	U
MTLSB016	303MTLSS013	AROCLOR-1248	10-May-95	0	0.5	0.038	MG/KG	U
MTLSB016	303MTLSS013	AROCLOR-1254	10-May-95	0	0.5	0.038	MG/KG	U
MTLSB016	303MTLSS013	AROCLOR-1260	10-May-95	0	0.5	0.038	MG/KG	U
MTLSB016	303MTLSS013	BETA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	DELTA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	DIELDRIN	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	DIESEL RANGE ORGANICS	10-May-95	0	0.5	28	MG/KG	U
MTLSB016	303MTLSS013	ENDOSULFAN I	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	ENDOSULFAN II	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	ENDOSULFAN SULFATE	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	ENDRIN	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	ENDRIN ALDEHYDE	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	ENDRIN KETONE	10-May-95	0	0.5	0.0038	MG/KG	U
MTLSB016	303MTLSS013	GAMMA-BHC (LINDANE)	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	GAMMA-CHLORDANE	10-May-95	0	0.5	0.0014	MG/KG	J
MTLSB016	303MTLSS013	HEPTACHLOR	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	HEPTACHLOR EPOXIDE	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB016	303MTLSS013	METHOXYCHLOR	10-May-95	0	0.5	0.019	MG/KG	U
MTLSB016	303MTLSS013	MOTOR OIL RANGE ORGANICS	10-May-95	0	0.5	190	MG/KG	
MTLSB016	303MTLSS013	TOXAPHENE	10-May-95	0	0.5	0.19	MG/KG	U
MTLSB017	303MTLSS105	4,4'-DDD	11-May-95	0	0.5	2	MG/KG	
MTLSB017	303MTLSS105	4,4'-DDE	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	4,4'-DDT	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	ALDRIN	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	ALPHA-BHC	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	ALPHA-CHLORDANE	11-May-95	0	0.5	4.3	MG/KG	
MTLSB017	303MTLSS105	AROCLOR-1016	11-May-95	0	0.5	7.1	MG/KG	U
MTLSB017	303MTLSS105	AROCLOR-1221	11-May-95	0	0.5	14	MG/KG	U
MTLSB017	303MTLSS105	AROCLOR-1232	11-May-95	0	0.5	7.1	MG/KG	U
MTLSB017	303MTLSS105	AROCLOR-1242	11-May-95	0	0.5	7.1	MG/KG	U
MTLSB017	303MTLSS105	AROCLOR-1248	11-May-95	0	0.5	7.1	MG/KG	U
MTLSB017	303MTLSS105	AROCLOR-1254	11-May-95	0	0.5	7.1	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB017	303MTLSS105	AROCLOR-1260	11-May-95	0	0.5	7.1	MG/KG	U
MTLSB017	303MTLSS105	BETA-BHC	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	DELTA-BHC	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	DIELDRIN	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	DIESEL RANGE ORGANICS	11-May-95	0	0.5	27	MG/KG	U
MTLSB017	303MTLSS105	ENDOSULFAN I	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	ENDOSULFAN II	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	ENDRIN	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	ENDRIN KETONE	11-May-95	0	0.5	0.71	MG/KG	U
MTLSB017	303MTLSS105	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	GAMMA-CHLORDANE	11-May-95	0	0.5	4.3	MG/KG	
MTLSB017	303MTLSS105	HEPTACHLOR	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.35	MG/KG	U
MTLSB017	303MTLSS105	METHOXYCHLOR	11-May-95	0	0.5	3.5	MG/KG	U
MTLSB017	303MTLSS105	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	470	MG/KG	
MTLSB017	303MTLSS105	TOXAPHENE	11-May-95	0	0.5	35	MG/KG	U
MTLSB018	303MTLSS106	4,4'-DDD	11-May-95	0	0.5	8.2	MG/KG	
MTLSB018	303MTLSS106	4,4'-DDE	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	4,4'-DDT	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	ALDRIN	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	ALPHA-BHC	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	ALPHA-CHLORDANE	11-May-95	0	0.5	13	MG/KG	
MTLSB018	303MTLSS106	AROCLOR-1016	11-May-95	0	0.5	18	MG/KG	U
MTLSB018	303MTLSS106	AROCLOR-1221	11-May-95	0	0.5	35	MG/KG	U
MTLSB018	303MTLSS106	AROCLOR-1232	11-May-95	0	0.5	18	MG/KG	U
MTLSB018	303MTLSS106	AROCLOR-1242	11-May-95	0	0.5	18	MG/KG	U
MTLSB018	303MTLSS106	AROCLOR-1248	11-May-95	0	0.5	18	MG/KG	U
MTLSB018	303MTLSS106	AROCLOR-1254	11-May-95	0	0.5	18	MG/KG	U
MTLSB018	303MTLSS106	AROCLOR-1260	11-May-95	0	0.5	18	MG/KG	U
MTLSB018	303MTLSS106	BETA-BHC	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	DELTA-BHC	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	DIELDRIN	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	DIESEL RANGE ORGANICS	11-May-95	0	0.5	540	MG/KG	
MTLSB018	303MTLSS106	ENDOSULFAN I	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	ENDOSULFAN II	11-May-95	0	0.5	1.8	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB018	303MTLSS106	ENDOSULFAN SULFATE	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	ENDRIN	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	ENDRIN ALDEHYDE	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	ENDRIN KETONE	11-May-95	0	0.5	1.8	MG/KG	U
MTLSB018	303MTLSS106	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	GAMMA-CHLORDANE	11-May-95	0	0.5	12	MG/KG	
MTLSB018	303MTLSS106	HEPTACHLOR	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.89	MG/KG	U
MTLSB018	303MTLSS106	METHOXYCHLOR	11-May-95	0	0.5	8.9	MG/KG	U
MTLSB018	303MTLSS106	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	12000	MG/KG	
MTLSB018	303MTLSS106	TOXAPHENE	11-May-95	0	0.5	89	MG/KG	U
MTLSB019	303MTLSS107	4,4'-DDD	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	4,4'-DDE	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	4,4'-DDT	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	ALDRIN	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	ALPHA-BHC	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	ALPHA-CHLORDANE	11-May-95	0	0.5	0.015	MG/KG	
MTLSB019	303MTLSS107	AROCLOR-1016	11-May-95	0	0.5	0.034	MG/KG	U
MTLSB019	303MTLSS107	AROCLOR-1221	11-May-95	0	0.5	0.069	MG/KG	U
MTLSB019	303MTLSS107	AROCLOR-1232	11-May-95	0	0.5	0.034	MG/KG	U
MTLSB019	303MTLSS107	AROCLOR-1242	11-May-95	0	0.5	0.034	MG/KG	U
MTLSB019	303MTLSS107	AROCLOR-1248	11-May-95	0	0.5	0.034	MG/KG	U
MTLSB019	303MTLSS107	AROCLOR-1254	11-May-95	0	0.5	0.034	MG/KG	U
MTLSB019	303MTLSS107	AROCLOR-1260	11-May-95	0	0.5	0.034	MG/KG	U
MTLSB019	303MTLSS107	BETA-BHC	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	DELTA-BHC	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	DIELDRIN	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	DIESEL RANGE ORGANICS	11-May-95	0	0.5	29	MG/KG	
MTLSB019	303MTLSS107	ENDOSULFAN I	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	ENDOSULFAN II	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	ENDRIN	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	ENDRIN KETONE	11-May-95	0	0.5	0.0034	MG/KG	U
MTLSB019	303MTLSS107	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	GAMMA-CHLORDANE	11-May-95	0	0.5	0.018	MG/KG	
MTLSB019	303MTLSS107	HEPTACHLOR	11-May-95	0	0.5	0.0017	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB019	303MTLSS107	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0017	MG/KG	U
MTLSB019	303MTLSS107	METHOXYCHLOR	11-May-95	0	0.5	0.017	MG/KG	U
MTLSB019	303MTLSS107	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	320	MG/KG	
MTLSB019	303MTLSS107	TOXAPHENE	11-May-95	0	0.5	0.17	MG/KG	U
MTLSB020	303MTLSS109	4,4'-DDD	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	4,4'-DDE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	4,4'-DDT	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	ALDRIN	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	ALPHA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	ALPHA-CHLORDANE	11-May-95	0	0.5	0.0086	MG/KG	
MTLSB020	303MTLSS109	AROCLOR-1016	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB020	303MTLSS109	AROCLOR-1221	11-May-95	0	0.5	0.076	MG/KG	U
MTLSB020	303MTLSS109	AROCLOR-1232	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB020	303MTLSS109	AROCLOR-1242	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB020	303MTLSS109	AROCLOR-1248	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB020	303MTLSS109	AROCLOR-1254	11-May-95	0	0.5	0.28	MG/KG	
MTLSB020	303MTLSS109	AROCLOR-1260	11-May-95	0	0.5	0.038	MG/KG	U
MTLSB020	303MTLSS109	BETA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	DELTA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	DIELDRIN	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	DIESEL RANGE ORGANICS	11-May-95	0	0.5	11	MG/KG	U
MTLSB020	303MTLSS109	ENDOSULFAN I	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	ENDOSULFAN II	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	ENDRIN	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	ENDRIN KETONE	11-May-95	0	0.5	0.0038	MG/KG	U
MTLSB020	303MTLSS109	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	GAMMA-CHLORDANE	11-May-95	0	0.5	0.0031	MG/KG	
MTLSB020	303MTLSS109	HEPTACHLOR	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB020	303MTLSS109	METHOXYCHLOR	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB020	303MTLSS109	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	21	MG/KG	
MTLSB020	303MTLSS109	TOXAPHENE	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB021	303MTLSS110	4,4'-DDD	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	4,4'-DDE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	4,4'-DDT	11-May-95	0	0.5	0.0037	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB021	303MTLSS110	ALDRIN	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	ALPHA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	ALPHA-CHLORDANE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	AROCLOR-1016	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB021	303MTLSS110	AROCLOR-1221	11-May-95	0	0.5	0.074	MG/KG	U
MTLSB021	303MTLSS110	AROCLOR-1232	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB021	303MTLSS110	AROCLOR-1242	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB021	303MTLSS110	AROCLOR-1248	11-May-95	0	0.5	0.036	MG/KG	J
MTLSB021	303MTLSS110	AROCLOR-1254	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB021	303MTLSS110	AROCLOR-1260	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB021	303MTLSS110	BETA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	DELTA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	DIELDRIN	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	DIESEL RANGE ORGANICS	11-May-95	0	0.5	11	MG/KG	U
MTLSB021	303MTLSS110	ENDOSULFAN I	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	ENDOSULFAN II	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	ENDRIN	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	ENDRIN KETONE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB021	303MTLSS110	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	GAMMA-CHLORDANE	11-May-95	0	0.5	0.0024	MG/KG	
MTLSB021	303MTLSS110	HEPTACHLOR	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB021	303MTLSS110	METHOXYCHLOR	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB021	303MTLSS110	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	39	MG/KG	
MTLSB021	303MTLSS110	TOXAPHENE	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB022	303MTLSS111	4,4'-DDD	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	4,4'-DDE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	4,4'-DDT	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	ALDRIN	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	ALPHA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	ALPHA-CHLORDANE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	AROCLOR-1016	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB022	303MTLSS111	AROCLOR-1221	11-May-95	0	0.5	0.075	MG/KG	U
MTLSB022	303MTLSS111	AROCLOR-1232	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB022	303MTLSS111	AROCLOR-1242	11-May-95	0	0.5	0.037	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB022	303MTLSS111	AROCLOR-1248	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB022	303MTLSS111	AROCLOR-1254	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB022	303MTLSS111	AROCLOR-1260	11-May-95	0	0.5	0.037	MG/KG	U
MTLSB022	303MTLSS111	BETA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	DELTA-BHC	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	DIELDRIN	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	DIESEL RANGE ORGANICS	11-May-95	0	0.5	11	MG/KG	U
MTLSB022	303MTLSS111	ENDOSULFAN I	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	ENDOSULFAN II	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	ENDOSULFAN SULFATE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	ENDRIN	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	ENDRIN ALDEHYDE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	ENDRIN KETONE	11-May-95	0	0.5	0.0037	MG/KG	U
MTLSB022	303MTLSS111	GAMMA-BHC (LINDANE)	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	GAMMA-CHLORDANE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	HEPTACHLOR	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	HEPTACHLOR EPOXIDE	11-May-95	0	0.5	0.0019	MG/KG	U
MTLSB022	303MTLSS111	METHOXYCHLOR	11-May-95	0	0.5	0.019	MG/KG	U
MTLSB022	303MTLSS111	MOTOR OIL RANGE ORGANICS	11-May-95	0	0.5	29	MG/KG	
MTLSB022	303MTLSS111	TOXAPHENE	11-May-95	0	0.5	0.19	MG/KG	U
MTLSB023	303MTLSS001	4,4'-DDD	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	4,4'-DDE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	4,4'-DDT	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	ALDRIN	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	ALPHA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	ALPHA-CHLORDANE	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1016	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1221	10-May-95	0	0.5	0.074	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1232	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1242	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1248	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1254	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB023	303MTLSS001	AROCLOR-1260	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB023	303MTLSS001	BETA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	DELTA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	DIELDRIN	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	DIESEL RANGE ORGANICS	10-May-95	0	0.5	11	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB023	303MTLSS001	ENDOSULFAN I	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	ENDOSULFAN II	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	ENDOSULFAN SULFATE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	ENDRIN	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	ENDRIN ALDEHYDE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	ENDRIN KETONE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB023	303MTLSS001	GAMMA-BHC (LINDANE)	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	GAMMA-CHLORDANE	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	HEPTACHLOR	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	HEPTACHLOR EPOXIDE	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB023	303MTLSS001	METHOXYCHLOR	10-May-95	0	0.5	0.019	MG/KG	U
MTLSB023	303MTLSS001	MOTOR OIL RANGE ORGANICS	10-May-95	0	0.5	63	MG/KG	
MTLSB023	303MTLSS001	TOXAPHENE	10-May-95	0	0.5	0.19	MG/KG	U
MTLSB023	303MTLSS002	4,4'-DDD	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	4,4'-DDE	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	4,4'-DDT	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	ALDRIN	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	ALPHA-BHC	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	ALPHA-CHLORDANE	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1016	10-May-95	3	4	0.037	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1221	10-May-95	3	4	0.075	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1232	10-May-95	3	4	0.037	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1242	10-May-95	3	4	0.037	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1248	10-May-95	3	4	0.037	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1254	10-May-95	3	4	0.037	MG/KG	U
MTLSB023	303MTLSS002	AROCLOR-1260	10-May-95	3	4	0.037	MG/KG	U
MTLSB023	303MTLSS002	BETA-BHC	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	DELTA-BHC	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	DIELDRIN	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	DIESEL RANGE ORGANICS	10-May-95	3	4	11	MG/KG	U
MTLSB023	303MTLSS002	ENDOSULFAN I	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	ENDOSULFAN II	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	ENDOSULFAN SULFATE	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	ENDRIN	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	ENDRIN ALDEHYDE	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	ENDRIN KETONE	10-May-95	3	4	0.0037	MG/KG	U
MTLSB023	303MTLSS002	GAMMA-BHC (LINDANE)	10-May-95	3	4	0.0019	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB023	303MTLSS002	GAMMA-CHLORDANE	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	HEPTACHLOR	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	HEPTACHLOR EPOXIDE	10-May-95	3	4	0.0019	MG/KG	U
MTLSB023	303MTLSS002	METHOXYCHLOR	10-May-95	3	4	0.019	MG/KG	U
MTLSB023	303MTLSS002	MOTOR OIL RANGE ORGANICS	10-May-95	3	4	25	MG/KG	
MTLSB023	303MTLSS002	TOXAPHENE	10-May-95	3	4	0.19	MG/KG	U
MTLSB024	303MTLSS003	4,4'-DDD	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	4,4'-DDE	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	4,4'-DDT	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	ALDRIN	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	ALPHA-BHC	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	ALPHA-CHLORDANE	10-May-95	0	0.5	0.0064	MG/KG	
MTLSB024	303MTLSS003	AROCLOR-1016	10-May-95	0	0.5	0.036	MG/KG	U
MTLSB024	303MTLSS003	AROCLOR-1221	10-May-95	0	0.5	0.072	MG/KG	U
MTLSB024	303MTLSS003	AROCLOR-1232	10-May-95	0	0.5	0.036	MG/KG	U
MTLSB024	303MTLSS003	AROCLOR-1242	10-May-95	0	0.5	0.036	MG/KG	U
MTLSB024	303MTLSS003	AROCLOR-1248	10-May-95	0	0.5	0.11	MG/KG	J
MTLSB024	303MTLSS003	AROCLOR-1254	10-May-95	0	0.5	0.15	MG/KG	
MTLSB024	303MTLSS003	AROCLOR-1260	10-May-95	0	0.5	0.036	MG/KG	U
MTLSB024	303MTLSS003	BETA-BHC	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	DELTA-BHC	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	DIELDRIN	10-May-95	0	0.5	0.0055	MG/KG	J
MTLSB024	303MTLSS003	DIESEL RANGE ORGANICS	10-May-95	0	0.5	11	MG/KG	U
MTLSB024	303MTLSS003	ENDOSULFAN I	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	ENDOSULFAN II	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	ENDOSULFAN SULFATE	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	ENDRIN	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	ENDRIN ALDEHYDE	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	ENDRIN KETONE	10-May-95	0	0.5	0.0036	MG/KG	U
MTLSB024	303MTLSS003	GAMMA-BHC (LINDANE)	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	GAMMA-CHLORDANE	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	HEPTACHLOR	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	HEPTACHLOR EPOXIDE	10-May-95	0	0.5	0.0018	MG/KG	U
MTLSB024	303MTLSS003	METHOXYCHLOR	10-May-95	0	0.5	0.018	MG/KG	U
MTLSB024	303MTLSS003	MOTOR OIL RANGE ORGANICS	10-May-95	0	0.5	43	MG/KG	
MTLSB024	303MTLSS003	TOXAPHENE	10-May-95	0	0.5	0.18	MG/KG	U
MTLSB024	303MTLSS004	4,4'-DDD	10-May-95	3	4	0.004	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB024	303MTLSS004	4,4'-DDE	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	4,4'-DDT	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	ALDRIN	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	ALPHA-BHC	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	ALPHA-CHLORDANE	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	AROCLOR-1016	10-May-95	3	4	0.04	MG/KG	U
MTLSB024	303MTLSS004	AROCLOR-1221	10-May-95	3	4	0.079	MG/KG	U
MTLSB024	303MTLSS004	AROCLOR-1232	10-May-95	3	4	0.04	MG/KG	U
MTLSB024	303MTLSS004	AROCLOR-1242	10-May-95	3	4	0.04	MG/KG	U
MTLSB024	303MTLSS004	AROCLOR-1248	10-May-95	3	4	0.049	MG/KG	
MTLSB024	303MTLSS004	AROCLOR-1254	10-May-95	3	4	0.04	MG/KG	U
MTLSB024	303MTLSS004	AROCLOR-1260	10-May-95	3	4	0.04	MG/KG	U
MTLSB024	303MTLSS004	BETA-BHC	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	DELTA-BHC	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	DIELDRIN	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	DIESEL RANGE ORGANICS	10-May-95	3	4	12	MG/KG	U
MTLSB024	303MTLSS004	ENDOSULFAN I	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	ENDOSULFAN II	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	ENDOSULFAN SULFATE	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	ENDRIN	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	ENDRIN ALDEHYDE	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	ENDRIN KETONE	10-May-95	3	4	0.004	MG/KG	U
MTLSB024	303MTLSS004	GAMMA-BHC (LINDANE)	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	GAMMA-CHLORDANE	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	HEPTACHLOR	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	HEPTACHLOR EPOXIDE	10-May-95	3	4	0.002	MG/KG	U
MTLSB024	303MTLSS004	METHOXYCHLOR	10-May-95	3	4	0.02	MG/KG	U
MTLSB024	303MTLSS004	MOTOR OIL RANGE ORGANICS	10-May-95	3	4	12	MG/KG	U
MTLSB024	303MTLSS004	TOXAPHENE	10-May-95	3	4	0.2	MG/KG	U
MTLSB025	303MTLSS005	4,4'-DDD	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	4,4'-DDE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	4,4'-DDT	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	ALDRIN	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	ALPHA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	ALPHA-CHLORDANE	10-May-95	0	0.5	0.0065	MG/KG	
MTLSB025	303MTLSS005	AROCLOR-1016	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB025	303MTLSS005	AROCLOR-1221	10-May-95	0	0.5	0.075	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB025	303MTLSS005	AROCLOR-1232	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB025	303MTLSS005	AROCLOR-1242	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB025	303MTLSS005	AROCLOR-1248	10-May-95	0	0.5	0.18	MG/KG	
MTLSB025	303MTLSS005	AROCLOR-1254	10-May-95	0	0.5	0.12	MG/KG	
MTLSB025	303MTLSS005	AROCLOR-1260	10-May-95	0	0.5	0.037	MG/KG	U
MTLSB025	303MTLSS005	BETA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	DELTA-BHC	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	DIELDRIN	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	DIESEL RANGE ORGANICS	10-May-95	0	0.5	11	MG/KG	U
MTLSB025	303MTLSS005	ENDOSULFAN I	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	ENDOSULFAN II	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	ENDOSULFAN SULFATE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	ENDRIN	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	ENDRIN ALDEHYDE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	ENDRIN KETONE	10-May-95	0	0.5	0.0037	MG/KG	U
MTLSB025	303MTLSS005	GAMMA-BHC (LINDANE)	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	GAMMA-CHLORDANE	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	HEPTACHLOR	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	HEPTACHLOR EPOXIDE	10-May-95	0	0.5	0.0019	MG/KG	U
MTLSB025	303MTLSS005	METHOXYCHLOR	10-May-95	0	0.5	0.019	MG/KG	U
MTLSB025	303MTLSS005	MOTOR OIL RANGE ORGANICS	10-May-95	0	0.5	34	MG/KG	
MTLSB025	303MTLSS005	TOXAPHENE	10-May-95	0	0.5	0.19	MG/KG	U
MTLSB025	303MTLSS006	4,4'-DDD	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	4,4'-DDE	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	4,4'-DDT	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	ALDRIN	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	ALPHA-BHC	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	ALPHA-CHLORDANE	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1016	10-May-95	3	4	0.039	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1221	10-May-95	3	4	0.078	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1232	10-May-95	3	4	0.039	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1242	10-May-95	3	4	0.039	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1248	10-May-95	3	4	0.039	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1254	10-May-95	3	4	0.039	MG/KG	U
MTLSB025	303MTLSS006	AROCLOR-1260	10-May-95	3	4	0.039	MG/KG	U
MTLSB025	303MTLSS006	BETA-BHC	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	DELTA-BHC	10-May-95	3	4	0.0019	MG/KG	U

TABLE A1-1
SOIL DATA USED TO CONDUCT THE SITE 27 PRG-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

POINT IDENTIFIER	SAMPLE IDENTIFIER	ANALYTE	DATE	TOP DEPTH	BOTTOM DEPTH	RESULT	UNIT	LAB QUALIFIER
MTLSB025	303MTLSS006	DIELDRIN	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	DIESEL RANGE ORGANICS	10-May-95	3	4	12	MG/KG	U
MTLSB025	303MTLSS006	ENDOSULFAN I	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	ENDOSULFAN II	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	ENDOSULFAN SULFATE	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	ENDRIN	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	ENDRIN ALDEHYDE	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	ENDRIN KETONE	10-May-95	3	4	0.0039	MG/KG	U
MTLSB025	303MTLSS006	GAMMA-BHC (LINDANE)	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	GAMMA-CHLORDANE	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	HEPTACHLOR	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	HEPTACHLOR EPOXIDE	10-May-95	3	4	0.0019	MG/KG	U
MTLSB025	303MTLSS006	METHOXYCHLOR	10-May-95	3	4	0.019	MG/KG	U
MTLSB025	303MTLSS006	MOTOR OIL RANGE ORGANICS	10-May-95	3	4	19	MG/KG	
MTLSB025	303MTLSS006	TOXAPHENE	10-May-95	3	4	0.19	MG/KG	U

Notes:

BHC	Benzene hexachloride
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
ID	Identifier
J	Estimated
MG/KG	Milligram per kilogram
U	Not detected

ATTACHMENT A2

SUMMARY OF CHEMICAL-SPECIFIC CANCER RISKS AND NON-CANCER ADVERSE HEALTH EFFECTS FOR THE REASONABLE MAXIMUM EXPOSURE SCENARIO

TABLE A2-1
CHEMICAL-SPECIFIC CANCER RISKS AND HAZARD INDICES FOR BUILDINGS IA-20 AND IA-36
REASONABLE MAXIMUM EXPOSURE SCENARIO
0 TO 0.5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Chemical of Potential Concern	RME EPC (mg/kg)	RESIDENT		INDUSTRIAL WORKER	
		Cancer Risk	Hazard Quotient	Cancer Risk	Hazard Quotient
Semivolatile Organic Compound					
4-Nitroaniline	0.15	NA	0.04	NA	0.003
Benzo(b)fluoranthene	0.024	3.87E-08	0.00001	8.28E-09	0.000001
Benzo(g,h,i)perylene	0.035	NA	0.00002	NA	0.000001
Chrysene	0.033	5.41E-09	0.000002	1.14E-10	0.0000003
Fluoranthene	0.038	NA	0.00002	NA	0.000001
Indeno(1,2,3-cd)pyrene	0.019	3.06E-08	0.000008	6.55E-09	0.000001
Pentachlorophenol	0.078	2.60E-08	0.00006	7.09E-09	0.000006
Pesticide					
Alpha-chlordane	22.79	1.42E-05	0.7	2.07E-06	0.03
Gamma-chlordane	21.69	1.36E-05	0.6	1.97E-06	0.03
Hazard Index		**3.E-05**	**2**	**4.E-06**	**0.08**

Notes:

EPC Exposure point concentration
mg/kg Milligrams per kilogram
NA Not Applicable
RME Reasonable maximum exposure

ATTACHMENT A3

SUMMARY OF CHEMICAL-SPECIFIC CANCER RISKS AND NON-CANCER ADVERSE HEALTH EFFECTS FOR THE MAXIMUM EXPOSURE SCENARIO

TABLE A3-1

CHEMICAL-SPECIFIC CANCER RISKS AND HAZARD INDICES FOR BUILDINGS IA-20 AND IA-36
MAXIMUM EXPOSURE SCENARIO
0 TO 0.5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSEMSSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

		RESIDENT		INDUSTRIAL WORKER	
Chemical of Potential Concern	**MAX EPC (mg/kg)**	**Cancer Risk**	**Hazard Quotient**	**Cancer Risk**	**Hazard Quotient**
Semivolatile Organic Compound					
4-Nitroaniline	0.15	NA	4.29E-02	NA	3.00E-03
Benzo(b)fluoranthene	0.024	3.87E-08	1.04E-05	8.28E-09	8.00E-07
Benzo(g,h,i)perylene	0.035	NA	1.52E-05	NA	6.48E-07
Chrysene	0.033	5.41E-09	1.50E-06	1.14E-10	3.30E-07
Fluoranthene	0.038	0.00E+00	1.65E-05	NA	1.27E-06
Indeno(1,2,3-cd)pyrene	0.019	3.06E-08	8.26E-06	6.55E-09	6.33E-07
Pentachlorophenol	0.078	2.60E-08	5.57E-05	7.09E-09	5.57E-06
Pyrene	0.031	NA	1.35E-05	NA	5.74E-07
Pesticide					
4,4'-DDD	8.2	3.42E-06	2.28E-01	4.82E-07	1.12E-02
Alpha-chlordane	24	1.50E-05	6.86E-01	2.18E-06	3.58E-02
Gamma-chlordane	23	1.44E-05	6.57E-01	2.09E-06	3.43E-02
Hazard Index		**3.E-05**	**2**	**5.E-06**	**0.08**

Notes:

DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
EPC	Exposure point concentration
MAX	Maximum detected concentration
mg/kg	Milligrams per kilogram
NA	Not Applicable

TABLE A3-2

CHEMICAL-SPECIFIC CANCER RISKS AND HAZARD INDICES FOR SITE 27 EXCLUDING BUILDINGS IA-20 AND IA-36
MAXIMUM EXPOSURE SCENARIO
0 TO 0.5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSEMSSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

		RESIDENT		INDUSTRIAL WORKER	
Chemical of Potential Concern	**MAX EPC (mg/kg)**	**Cancer Risk**	**Hazard Quotient**	**Cancer Risk**	**Hazard Quotient**
Semivolatile Organic Compound					
Benzo(a)anthracene	0.028	4.52E-08	1.27E-06	9.66E-09	2.80E-07
Benzo(a)pyrene	0.023	3.71E-07	1.00E-05	7.93E-08	4.26E-07
Benzo(b)fluoranthene	0.018	2.90E-08	7.83E-06	6.21E-09	6.00E-07
Benzo(g,h,i)perylene	0.026	NA	1.13E-05	NA	4.81E-07
Benzo(k)fluoranthene	0.019	3.11E-08	8.26E-06	6.55E-10	6.33E-07
Chrysene	0.03	4.92E-09	1.36E-06	1.03E-10	3.00E-07
Fluoranthene	0.028	NA	1.22E-05	NA	9.33E-07
Phenol	0.38	NA	1.03E-05	NA	3.80E-06
Pyrene	0.021	NA	9.13E-06	NA	3.89E-07
Pesticide					
4,4'-DDD	0.058	2.42E-08	1.61E-03	3.41E-09	7.95E-05
4,4'-DDE	0.031	1.82E-08	8.61E-04	2.58E-09	4.25E-05
4,4'-DDT	0.014	8.24E-09	3.89E-04	1.17E-09	1.92E-05
Alpha-chlordane	0.1	6.25E-08	2.86E-03	9.09E-09	1.49E-04
Aroclor-1248	0.5	2.27E-06	4.55E-01	5.00E-07	3.57E-02
Aroclor-1254	1	4.55E-06	9.09E-01	1.00E-06	7.14E-02
Dieldrin	0.0055	1.83E-07	1.77E-03	3.67E-08	1.25E-04
Endosulfan I	0.024	NA	6.49E-05	NA	4.53E-06
Gamma-chlordane	0.1	6.25E-08	2.86E-03	9.09E-09	1.49E-04
Hazard Index		**8.E-06**	**1**	**2.E-06**	**0.1**

Notes:

DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethene
DDT Dichlorodiphenyltrichloroethane
EPC Exposure point concentration
MAX Maximum detected concentration
mg/kg Milligrams per kilogram
NA Not Applicable

TABLE A3-3

CHEMICAL-SPECIFIC CANCER RISKS AND HAZARD INDICES FOR SITE 27 EXCLUDING BUILDINGS IA-20 AND IA-36
MAXIMUM EXPOSURE SCENARIO
0 TO 4 FEET BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSEMSSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

		RESIDENT		INDUSTRIAL WORKER	
Chemical of Potential Concern	**MAX EPC (mg/kg)**	**Cancer Risk**	**Hazard Quotient**	**Cancer Risk**	**Hazard Quotient**
Semivolatile Organic Compound					
Benzo(a)anthracene	0.028	4.52E-08	1.27E-06	9.66E-09	2.80E-07
Benzo(a)pyrene	0.023	3.71E-07	1.00E-05	7.93E-08	4.26E-07
Benzo(b)fluoranthene	0.018	2.90E-08	7.83E-06	6.21E-09	6.00E-07
Benzo(g,h,i)perylene	0.026	NA	1.13E-05	NA	4.81E-07
Benzo(k)fluoranthene	0.019	3.11E-08	8.26E-06	6.55E-10	6.33E-07
Chrysene	0.03	4.92E-09	1.36E-06	1.03E-10	3.00E-07
Fluoranthene	0.028	NA	1.22E-05	NA	9.33E-07
Phenol	0.38	NA	1.03E-05	NA	3.80E-06
Pyrene	0.021	NA	9.13E-06	NA	3.89E-07
Pesticide					
4,4'-DDD	0.058	2.42E-08	1.61E-03	3.41E-09	7.95E-05
4,4'-DDE	0.031	1.82E-08	8.61E-04	2.58E-09	4.25E-05
4,4'-DDT	0.014	8.24E-09	3.89E-04	1.17E-09	1.92E-05
Alpha-chlordane	0.1	6.25E-08	2.86E-03	9.09E-09	1.49E-04
Aroclor-1248	0.5	2.27E-06	4.55E-01	5.00E-07	3.57E-02
Aroclor-1254	1	4.55E-06	9.09E-01	1.00E-06	7.14E-02
Dieldrin	0.0055	1.83E-07	1.77E-03	3.67E-08	1.25E-04
Endosulfan I	0.024	NA	6.49E-05	NA	4.53E-06
Gamma-chlordane	0.1	6.25E-08	2.86E-03	9.09E-09	1.49E-04
Hazard Index		**8.E-06**	**1**	**2.E-06**	**0.1**

Notes:

DDD	Dichlorodiphenyldichloroethane	MAX	Maximum detected concentration
DDE	Dichlorodiphenyldichloroethene	mg/kg	Milligrams per kilogram
DDT	Dichlorodiphenyltrichloroethane	NA	Not Applicable
EPC	Exposure point concentration		

TABLE A3-4

CHEMICAL-SPECIFIC CANCER RISKS AND HAZARD INDICES: ENTIRE SITE 27 AREA
MAXIMUM EXPOSURE SCENARIO
0 TO 0.5 FOOT BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSEMSSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

		RESIDENT		INDUSTRIAL WORKER	
Chemical of Potential Concern	**MAX EPC (mg/kg)**	**Cancer Risk**	**Hazard Quotient**	**Cancer Risk**	**Hazard Quotient**
Semivolatile Organic Compound					
4-Nitroaniline	0.15	NA	4.29E-02	NA	3.00E-03
Benzo(a)anthracene	0.028	4.52E-08	1.27E-06	9.66E-09	2.80E-07
Benzo(a)pyrene	0.023	3.71E-07	1.00E-05	7.93E-08	4.26E-07
Benzo(b)fluoranthene	0.024	3.87E-08	1.04E-05	8.28E-09	8.00E-07
Benzo(g,h,i)perylene	0.035	NA	1.52E-05	NA	6.48E-07
Benzo(k)fluoranthene	0.019	3.11E-08	8.26E-06	6.55E-10	6.33E-07
Chrysene	0.033	5.41E-09	1.50E-06	1.14E-10	3.30E-07
Fluoranthene	0.038	NA	1.65E-05	NA	1.27E-06
Indeno(1,2,3-cd)pyrene	0.019	3.06E-08	8.26E-06	6.55E-09	6.33E-07
Pentachlorophenol	0.078	2.60E-08	5.57E-05	7.09E-09	5.57E-06
Phenol	0.380	NA	1.03E-05	NA	3.80E-06
Pyrene	0.031	NA	1.35E-05	NA	5.74E-07
Pesticide					
4,4'-DDD	8	3.42E-06	2.28E-01	4.82E-07	1.12E-02
4,4'-DDE	0.031	1.82E-08	8.61E-04	2.58E-09	4.25E-05
4,4'-DDT	0.014	8.24E-09	3.89E-04	1.17E-09	1.92E-05
Alpha-chlordane	24	1.50E-05	6.86E-01	2.18E-06	3.58E-02
Aroclor-1248	0.5	2.27E-06	4.55E-01	5.00E-07	3.57E-02
Aroclor-1254	1	4.55E-06	9.09E-01	1.00E-06	7.14E-02
Dieldrin	0.0055	1.83E-07	1.77E-03	3.67E-08	1.25E-04
Endosulfan I	0.024	NA	6.49E-05	NA	4.53E-06
Gamma-chlordane	23	1.44E-05	6.57E-01	2.09E-06	3.43E-02
Hazard Index		**4.E-05**	**3**	**6.E-06**	**0.2**

Notes:

DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethene
DDT Dichlorodiphenyltrichloroethane
EPC Exposure point concentration
MAX Maximum detected concentration
mg/kg Milligrams per kilogram
NA Not Applicable

TABLE A3-5

CHEMICAL-SPECIFIC CANCER RISKS AND HAZARD INDICES: ENTIRE SITE 27 AREA
MAXIMUM EXPOSURE SCENARIO
0 TO 4 FEET BELOW GROUND SURFACE
PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSEMSSMENT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

		RESIDENT		INDUSTRIAL WORKER	
Chemical of Potential Concern	MAX EPC (mg/kg)	Cancer Risk	Hazard Quotient	Cancer Risk	Hazard Quotient
Semivolatile Organic Compound					
4-Nitroaniline	0.15	NA	4.29E-02	NA	3.00E-03
Benzo(a)anthracene	0.028	4.52E-08	1.27E-06	9.66E-09	2.80E-07
Benzo(a)pyrene	0.023	3.71E-07	1.00E-05	7.93E-08	4.26E-07
Benzo(b)fluoranthene	0.024	3.87E-08	1.04E-05	8.28E-09	8.00E-07
Benzo(g,h,i)perylene	0.035	NA	1.52E-05	NA	6.48E-07
Benzo(k)fluoranthene	0.019	3.11E-08	8.26E-06	6.55E-10	6.33E-07
Chrysene	0.033	5.41E-09	1.50E-06	1.14E-10	3.30E-07
Fluoranthene	0.038	NA	1.65E-05	NA	1.27E-06
Indeno(1,2,3-cd)pyrene	0.019	3.06E-08	8.26E-06	6.55E-09	6.33E-07
Pentachlorophenol	0.078	2.60E-08	5.57E-05	7.09E-09	5.57E-06
Phenol	0.38	NA	1.03E-05	NA	3.80E-06
Pyrene	0.031	NA	1.35E-05	NA	5.74E-07
Pesticide					
4,4'-DDD	8	3.42E-06	2.28E-01	4.82E-07	1.12E-02
4,4'-DDE	0.031	1.82E-08	8.61E-04	2.58E-09	4.25E-05
4,4'-DDT	0.014	8.24E-09	3.89E-04	1.17E-09	1.92E-05
Alpha-chlordane	24	1.50E-05	6.86E-01	2.18E-06	3.58E-02
Aroclor-1248	0.5	2.27E-06	4.55E-01	5.00E-07	3.57E-02
Aroclor-1254	1	4.55E-06	9.09E-01	1.00E-06	7.14E-02
Dieldrin	0.0055	1.83E-07	1.77E-03	3.67E-08	1.25E-04
Endosulfan I	0.024	NA	6.49E-05	NA	4.53E-06
Gamma-chlordane	23	1.44E-05	6.57E-01	2.09E-06	3.43E-02
Hazard Index		**4.E-05**	**3**	**6.E-06**	**0.2**

Notes:

DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
EPC	Exposure point concentration
MAX	Maximum detected concentration
mg/kg	Milligrams per kilogram
NA	Not Applicable

TABLE A3-6

SUMMARY OF RESULTS OF THE PRELIMINARY REMEDIATION GOAL-BASED HUMAN HEALTH RISK ASSESSMENT[a]
MAXIMUM EXPOSURE SCENARIO
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

	RESIDENTIAL		**INDUSTRIAL**	
	Cancer Risk	**Hazard Quotient**	**Cancer Risk**	**Hazard Quotient**
Current Site Conditions[b]				
Buildings IA-20 and IA-36	3.E-05	**2** [d]	5.E-06	0.08
Site 27 Excluding the Buildings IA-20 and IA-36	8.E-06	1	2.E-06	0.1 [e]
Entire Site 27 Area	4.E-05	3	6.E-06	0.2
Future Site Conditions[f]				
Buildings IA-20 and IA-36	- -[g]	- -	- -	- -
Site 27 Excluding the Buildings IA-20 and IA-36	8.E-06	1	2.E-06	0.1
Entire Site 27 Area	4.E-05	3	6.E-06	0.1

Notes:

a For all evaluations of Site 27 composite soil samples were excluded from evaluation (see Section A1.5.1).
b Current site conditions were evaluated using soil data collected from 0 to 0.5 ft bgs.
c Soil samples MTLSB014, MTLSB017, MTLSB018, and MTLSB019 were used to evaluate chemical impacts at Buildings IA-20 and IA-36.
d Alpha and gamma chlordane account for approximately 87% of the total hazard index of 2 .
e Aroclor 1248 and 1254 account for approximately 99% of the total hazard index of 1.
f Future site conditions were evaluated using soil data collected at all available depths (i.e., down to 4 ft bgs).
g Soil samples were not collected beyond 0.5 feet below ground surface at Buildings IA-20 and IA-36. For this reason, impacts associated with future site conditions could not be quantified.

APPENDIX B

COST ESTIMATES FOR PROPOSED REMEDIAL ALTERNATIVES

The costs associated with Alternatives 2 and 3 are summarized in Tables B-1 through B-3. These costs are for comparison purposes only and are intended to have an estimated accuracy of only plus 50 percent to minus 30 percent, as recommended in the Comprehensive Response, Compensation, and Liability Act of 1980 (CERCLA) feasibility study guidance (EPA 2000b). Many design variables and permitting requirements have not been established. Construction cost estimates will be refined after the system design is complete. A contingency of 20 percent of the direct costs and annual operation and maintenance (O&M) costs is included in these estimates to reflect uncertainty.

GENERAL ASSUMPTIONS

- Estimated costs for documents, such as permits and plans, based on past experience
- Used unit costs provided in RS Means (2001a, 2001b), where available
- Obtained vendor quotes for disposal

SPECIFIC ASSUMPTIONS

Alternative 2

- A five-year engineering review report will be prepared.
- Annual O&M, which consists of a site walk, will occur once per year for 30 years. The annual costs were discounted over 30 years using a discount factor of 3.9 percent. Assumptions based on EPA (2000b).
- Site walk costs assumed 10 hours per year by a field engineer. Unit cost was taken from RS Means (2001a).

Alternative 3

- Monitoring, Sampling, Testing, and Analysis
  - Nineteen soil samples will be collected to complete the post-excavation confirmation sampling and waste characterization. The confirmation soil samples will be collected on 20-foot centers (16 total) over the area excavated (3,000 square feet). Samples will be analyzed for pesticides. One soil sample will also be collected per 100 cubic yards of soil removed for waste characterization.
  - Disposal of excavated soil will be conducted at a Class I facility in Port Arthur, Texas. No characterization samples will be required for landfill disposal because investigation samples will be used for characterization.
  - Disposal of building demolition materials will be conduced at a Class III facility in Altamont, California.
  - Approximately 20 samples will be required for the asbestos survey. This estimate is based on the size of the buildings.

- Approximately 20 samples will be required for the lead-based paint survey. This estimate is based on the size of the buildings.
- Sample count for air monitoring is based on assumed days of work (20), with one sample per day per air monitoring station. The air monitoring station will be a manual remote toxic air sampler.

- Site Work
  - Unit costs for building demolition are based on RS Means (2001a).
    - Assumed concrete construction for Building IA-20. Volume based on a 1,125-square-foot (ft2) floor (measured) and an estimated 15-foot wall height.
    - Assumed steel construction for Building IS-36. Volume based on a 700-ft^2 floor (measured) and an estimated 15-foot wall height.
    - Assumed a 6-inch concrete slab foundation for both buildings. Floor area based on measurements.
  - Asbestos and lead-based paint survey and removal are based on professional judgment.
  - Excavation costs are based on excavation of 3,000 ft^2 of soil to a depth of 3 feet below ground surface. Unit cost was taken from RS Means (2001a).

- Disposal
  - Unit costs for loading and transportation costs are based on RS Means (2001a).
    - Building material will be transported to a Class III landfill. Assumes ten 40-mile trips. Number of trips is based on building and slab material volume (200 CY), which is double to account for empty space in truck.
    - Soil will be transported to a Class I landfill. Assumes 2,000 miles to Port Arthur. Transportation costs based on vendor quote.
  - Disposal costs are based on landfill estimates.

- Site Restoration
  - Unit costs for backfill, compaction, grading, and revegetation are based on RS Means (2001b).

- Distributive Costs (includes professional labor personnel and personal protective equipment)
  - Assumes 4 weeks (20 days) of fieldwork. Unit cost was taken from RS Means (2001a).

REFERENCES

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EPA. 2000b. "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study." EPA 540-R-00-002. OSWER 9355.0-75. July.

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TABLE B-1
COST ESTIMATE SUMMARY FOR REMEDIAL ALTERNATIVES
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

Alternative		Capital Cost	Annual O&M Cost [1]	Total NPV Cost [2]
1	No Action	$0	$0	$0
2	Institutional Controls	$24,000	$96,843	$120,843
3	Building Demolition and Debris Disposal/ Soil Excavation and Incineration Off-Site	$682,225	$0	$682,225

Notes:
1 Annual O&M Cost assumes one site visit per year for the next 30 years.
2 Total NPV cost includes capital costs and NPV of annual O&M Cost. Present value based on a 3.9 percent discount rate.

NPV Net present value
O&M Operation and Maintenance

TABLE B-2
ALTERNATIVE 2
LAND USE CONTROL COSTS
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

	Description	Quantity	Unit	Unit Cost	Item Cost	Total	Source	Notes
	CAPITAL COSTS FOR ALTERNATIVE 2							
	Description	**Quantity**	**Unit**	**Unit Cost**	**Item Cost**	**Total**	**Source**	**Notes**
2.1	Land Use Control Remedial Design (LUC RD) Preparation	1	LS	15,000.00	5,000.00	$20,000.00		
	Contingency	20%				$4,000.00		
	SUBTOTAL					$24,000.00		
	TOTAL CAPITAL COST					**$24,000.00**		
	O&M COSTS FOR ALTERNATIVE 2							
	Description	**Quantity**	**Unit**	**Unit Cost**	**Item Cost**	**Total**	**Source**	**Notes**
2.2	5-year Engineering Report	1	LS	10,000.00	5,000.00	$15,000.00		
	Contingency	20%				$3,000.00		
	SUBTOTAL					$18,000.00		
	Net Present Value (1)					**$60,609.79**		
2.3	Annual Site Walk	20	HR	75.00	86.25	$1,725.00	Means 01310 700 0120	Field Engineer - average cost
	Contingency	20%				$345.00		
	SUBTOTAL					$2,070.00		
	Net Present Value (1)					**$36,233.15**		
	TOTAL O&M COST					**$96,842.95**		
	TOTAL CAPITAL COST & LIFETIME O&M					**$120,842.95**		**30 years**

Notes:
1 3.9% discount factor was applied to calculate the net present value of 30 years of O&M.

HR Hours
LS Lump sum
NPV Net present value
O&M Operation and Maintenance

TABLE B-3
ALTERNATIVE 3
BUILDING DEMOLITION AND DEBRIS DISPOSAL/ SOIL EXCAVATION AND INCINERATION OFF-SITE
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

	Description	Quantity	Unit	Unit Cost	Unit Cost with Localization Factor	Total	Unit Price Source	Assumptions
3.1	**DIRECT COSTS**							
3.1.1	**Mobilization/Demobilization**							
3.1.1.1	Mobilization of Construction Equipment	1	LS	$5,000.00		$5,000.00	Engineering Experience	3 flat bed trucks, 1 excavator, 1 bulldozer,
3.1.1.2	Demobilization of Construction Equipment	1	LS	$5,000.00		$5,000.00	Engineering Experience	3 flat bed trucks, 1 excavator, 1 bulldozer,
3.1.1.3	Mobilization of Personnel	6	EA	$63.75	$73.31	$439.88	Means - 33 01 0205	Assume crew 50 miles from site
3.1.1.4	Demobilization of Personnel	6	EA	$63.75	$73.31	$439.88	Means - 33 01 0205	Assume crew 50 miles from site
3.1.1.5	Temporary Offices (Field Trailer)	1	MO	$500.00		$500.00	Vendor Quote	Field trailer with desk and chair
3.1.1.6	Security Fencing	300	LF	$6.11	$7.03	$2,107.95	Means - 99 04 0302	6' chain link fence
3.1.1.7	Portable Toilets	1	MO	$76.03	$87.43	$87.43	Means - 99 04 0501	
3.1.1.8	Temporary Electric Power	2.56	CSF	$83.28	$95.77	$245.18	Means - 99 04 0801	
	SUBTOTAL					$13,820.31		
3.1.2	**Monitoring, Sampling, Testing, and Analysis**							
3.1.2.1	Sampling and Analysis Plan	1	LS	$25,000.00		$25,000.00	Engineering Experience	
3.1.2.2	Soil Confirmation Sample Analysis - Pesticides	19	EA	$310.00	$356.50	$6,773.50	Means - 33 02 1717	Pesticides/PCBs, (SW 3550B/SW 8081/8082), Soil Analysis
	Soil Sample Collection for Disposal	4	EA	$450.00	$517.50	$2,070.00	Kettleman Disposal Facility	Metals (6010B/7000), VOC (8260), Pesticides (8081A), and TCLP (Method 1311)
3.1.2.3	Soil Sample Collection	19	EA	$50.00		$950.00	Engineering Experience	
3.1.2.4	Asbestos Analysis	20	EA	$20.00		$400.00	Vendor Quote	Asbestos in Bulk Insulation Samples (EPA/600/R-93/116)
3.1.2.5	Lead Paint Analysis	20	EA	$13.33	$15.33	$306.59	Means - 33 02 1710	Metals (EPA 6010), Per Each Metal, Soil Analysis
3.1.2.6	Air Monitoring Station	4	EA	$678.00	$779.70	$3,118.80	Means - 33 02 0301	Remote Toxic Air Sampler, Manual
3.1.2.7	Air Monitoring Sample Analysis - Pesticides	80	EA	$255.00	$293.25	$23,460.00	Means - 33 02 1810	Pesticides/PCBs, GC, air (TO-4)
3.1.2.8	Data Validation (at 15% of analytical)	15%				$4,641.01	Engineering Experience	
	SUBTOTAL					$66,719.90		
3.1.3	**Site Work**							
3.1.3.1	Remedial Excavation Work Plan	1	LS	$35,000.00		$35,000.00	Engineering Experience	
3.1.3.2	Asbestos Survey	1825	SF	$0.95		$1,733.75	Engineering Experience	
3.1.3.3	Asbestos Removal	1	LS	$10,000.00		$10,000.00	Engineering Experience	
3.1.3.4	Lead Paint Survey	1825	SF	$0.95		$1,733.75	Engineering Experience	
3.1.3.5	Lead Paint Removal	1	LS	$5,000.00		$5,000.00	Engineering Experience	
3.1.3.6	Utilities Survey	3000	SF	$1.50		$4,500.00	Engineering Experience	
3.1.3.7	Demolition of Concrete Building	17250	CF	$0.33	$0.38	$6,546.38	Means 02220 100 0500	Small building, single building
3.1.3.8	Demolition of Steel Building	10500	CF	$0.25	$0.29	$3,018.75	Means 02220 100 0600	Small building, single building
3.1.3.9	Demolition of Concrete Slab	1825	SF	$5.50	$6.33	$11,543.13	Means 02220 550 0440	6" thick, rods
3.1.3.10	Dust Control	1	LS	$5,000.00		$5,000.00	Engineering Experience	
3.1.3.11	Clearing and Grubbing	0.07	ACRE	$588.38	$676.64	$47.36	Means - 17 01 0103	Medium brush with average grub and some trees, clearing
3.1.3.12	Soil Excavation	330	CY	$9.30	$10.70	$3,529.35	Means 02315 440 2050	Machine excavation, common earth, 1.5 CY bucket
3.1.3.13	Surveying	3	DAY	$665.28	$765.07	$2,295.22	Means - 99 04 1201	2-man crew
	SUBTOTAL					$89,947.68		

TABLE B-3 (Continued)
ALTERNATIVE 3
BUILDING DEMOLITION AND DEBRIS DISPOSAL/ SOIL EXCAVATION AND INCINERATION OFF-SITE
SITE 27 FEASIBILITY STUDY
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

	Description	Quantity	Unit	Unit Cost	Unit Cost with Localization Factor	Total	Unit Price Source	Assumptions
3.1.4	**Disposal (Commercial)**							
3.1.4.1	Loading and Disposal - Steel Frame	80	CY	$8.70	$10.01	$800.40	Means 02225 720 0200	
3.1.4.2	Loading and Disposal - Concrete Frame	100	CY	$10.30	$11.85	$1,184.50	Means 02225 720 0300	
3.1.4.3	Hauling - Demolition Material to Class III Facility	400	MI	$0.53	$0.61	$243.80	Means 02225 730 5100	Over 8 CY truck, 40 miles, 10 truck loads
3.1.4.4	Hauling to Incineration Facility Pt. Arthur, Texas	2000	MI	$1.75		$66,500.00	Vendor Quote	2000 miles from Concord, CA to Port Arthur, TX (Assume 19 Trips, 18 cubic yds/truck)
3.1.4.5	Class I Landfill Disposal Fees	495	TON	$480.00		$237,600.00	Port Arthur Landfill	330 CY, 1.5 tons per cy
3.1.4.6	Class III Landfill Disposal Fees	270	TON	$40.00		$10,800.00	Altamount Landfill	180 CY, 1.5 tons per cy
	SUBTOTAL					$317,128.70		
3.1.5	**Site Restoration**							
3.1.5.1	Backfill and Compaction	330	CY	$7.90	$9.09	$2,998.05	Means 17 03 0423	Unclassified fill, 6" lifts, off-site, includes delivery, spreading, and compaction
3.1.5.2	Grading	330	SY	$3.05	$3.51	$1,157.48	Means 17 03 0101	Rough grading, D6 dozer
3.1.5.3	Revegetation	0.07	ACRE	$493.54	$567.57	$39.73	Means 18 05 0401	Seeding, 67% level & 33% slope, hydroseeding, adjusted for full day cost
	SUBTOTAL					$4,195.25		
3.1.6	**Site Closure**							
3.1.6.1	Site Closure Report	1	LS	$40,000.00		$40,000.00	Engineering Experience	
	SUBTOTAL					$40,000.00		
	DIRECT COSTS SUBTOTAL					$531,811.85		
	Contingency	20%				$106,362.37		
3.2	**DISTRIBUTIVE COSTS**							
3.2.1	Project Management	4	WK	$2,230.00	$2,564.50	$10,258.00	Means 01300 700 0200	Site project manager - average cost
3.2.2	Construction Supervision	4	WK	$2,105.00	$2,420.75	$9,683.00	Means 01300 700 0260	Superintendent - average cost
3.2.3	Engineering (Design, Permitting)	1	LS	$3,400.00		$18,254.80	Engineering Experience	5% of total cost excluding disposal
3.2.4	Personal Protective Equipment	1	LS	$1,306.26		$1,306.26	Means - 33 01 04	6 men, tyvek suits, gloves, respirators, boots, hard hats
3.2.5	Health and Safety Monitoring and Personnel	4	WK	$988.80	$1,137.12	$4,548.48	Means - 99 01 0702	Safety Engineer - average cost
	DISTRIBUTIVE COSTS SUBTOTAL					$44,050.54		
	TOTAL CAPITAL COST					**$682,224.76**		

O&M COSTS FOR ALTERNATIVE 3

	Description	Quantity	Unit	Unit Cost	Unit Cost with Localization Factor	Total	Source	Notes
3.3	**ANNUAL O&M COSTS**							
3.3.1	O&M is not required under Alternative 3.					$0.00		**No costs are associated with O&M.**
	SUBTOTAL					$0.00		
	TOTAL O&M COST					**$0.00**		
	TOTAL ALTERNATIVE COST					**$682,224.76**		

Notes:

Localization factor applied is 1.15 per RSMeans "Environmental Remediation Cost Data - Unit Price. 2000."

CF	Cubic feet	LS	Lump sum	SF	Square feet
CSF	Hundred square feet	MI	Miles	SY	Square yards
CY	Cubic yard	NPV	Net present value	TON	Tons
EA	Each	O&M	Operation and Maintenance	WK	Week
HR	Hours				

APPENDIX C

RESPONSE TO AGENCY COMMENTS

RESPONSES TO AGENCY COMMENTS ON THE DRAFT FOCUSED FEASIBILITY STUDY REPORT SITE 27 NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD CONCORD, CALIFORNIA

This document presents the U.S. Department of the Navy (Navy) responses to comments from the regulatory agencies on the draft focused feasibility study (FS) report for Site 27, Naval Weapons Station Seal Beach Detachment Concord, California, dated October 31, 2002. The comments addressed in the following document were received from the U.S. Environmental Protection Agency (EPA) on December 27, 2002, and the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) on November 27, 2002. No written comments were received from the California Department of Toxic Substances Control or the Restoration Advisory Board. EPA enclosures that were provided with the comments dated December 27, 2002, are included following the responses to comments.

Agency comments are presented in boldface type.

RESPONSE TO COMMENTS FROM EPA

EPA General Comments

1. **EPA Comment:** **The Navy's assumptions regarding the costs for Alternatives 2 and 3 require revision. The assumptions regarding Alternative 3, Excavation and Off-Site Disposal, appear to be significantly higher than necessary because the Navy assumes that excavated materials must be taken to a Class 1 hazardous waste landfill in Texas and incinerated, while the assumptions for the cost estimate for Alternative 2, Land Use Controls, appear to have been underestimated. The cost estimates for each of these alternatives should be revised.**

   Response: Based on pesticide concentrations at the site, the soil cannot be disposed of at a Class II/ Class III Facility (Altamont Landfill Facility 2003). The soil could be accepted at a California Class I Facility for disposal in a landfill if the soil is classified as non-Resource Conservation and Recovery Act (RCRA) hazardous waste (Kettleman Hills Facility 2003). However, Toxicity Characteristic Leaching Procedure (TCLP) analysis has not been conducted on the soil. The TCLP criteria for chlordane, which is a RCRA "D" listed waste (based on toxicity), is very low (0.03 milligrams per liter [mg/L]), and it is possible that the isomers of chlordane present in soil at locations MTLSB014 and MTLSB018 will exceed the TCLP threshold. Using maximum concentrations of isomers of chlordane detected at location MTLSB014 (47 mg/kg), the applying the 20-times dilution "rule of thumb," the corresponding theoretical TCLP concentration is 2.35 mg/L, which exceeds the TCLP limit and would classify the soil as RCRA hazardous waste because of its toxicity characteristic. If the waste is classified as a RCRA hazardous waste, the best demonstrated available technology (BDAT) is incineration of soil at the Port Arthur Facility in Texas. The Navy recognizes that a waiver could be granted as discussed in EPA Enclosure 3; however, because there is no guarantee of a waiver and the waste has not been classified, the Navy assumes for the purposes of the FS that the waste material would need to be incinerated. The cost for incineration at the Port Arthur Facility based on a recent quote is $480/ton (Kettleman Hills 2003a). In the original estimate, higher costs of $1,600/ton were quoted for disposal. The costs in the draft focused FS have been updated to reflect this new disposal quote. The cost for disposal and transport to a Class I Landfill for non-RCRA hazardous waste is $65/ton (Kettleman Hills 2003b). The total disposal and transportation cost to the Port Arthur facility is $615/ton.

The cost estimate for Alternative 2 has been revised to include the cost associated with preparing a 5-year engineering report.

2. **EPA Comment:** **U.S. EPA requests that the Navy initiate interim Institutional Control (IC) actions for Site 27, that would include signs posted on Buildings IA-20 and IA-36 indicating contaminated soils exist around the perimeter and beneath the building foundations and are not to be disturbed or excavated. A Navy contact for additional information should also be included.**

Response: As stated in Section 3.3.2 of the draft focused FS, placement of warning signs on the building that soils are contaminated with chlordane is proposed as part of Alternative 2 to warn potential site workers of the hazards. Site 27 is only accessible to site workers and not the general public. The signs will include contact information as suggested. Base personnel have been informed of the environmental condition of the site. Therefore, the Navy believes that interim IC actions are not needed at the site.

EPA Specific Comments

3. **EPA Comment:** **Section 3.3.3, Alternative 3: Excavation and Off-Site Disposal, Page 3-7: The text indicates that the California Health and Safety Code (Section 25157.8(a)) would prevent the disposal of soils containing chlordane at concentrations greater than 2.5 mg/kg at anything but a hazardous waste landfill. However, based on inspection of this regulation, it is not clear that this is the case. Please indicate which part of Section 25157.8(a) would prohibit the disposal of the soil at anything but a Class I landfill (the text of the section is provided as Enclosure 1 to these comments).**

Additionally, based on Title 22 of the California Code of Regulations (CCR), Section 66268.44 (a)(1)(B), it appears possible that the Navy could obtain a treatability variance to dispose of the soil without treatment because it is technically inappropriate (i.e., combustion of large amounts of mildly contaminated environmental media). The text of this section is provided as Enclosure 2 to these comments. Please revise the report to demonstrate that the Navy has considered all available disposal options and requirements for disposal of soils from Site 27.

Response: The current California Health and Safety Code (Section 25157.8(a) does not appear to require that soils containing chlordane at concentrations greater than 2.5 milligrams per kilogram (mg/kg) be disposed of at a hazardous waste landfill. The text in Section 3.3.3 related to the statement has been removed.

The Navy appreciates EPA's recommendation of a possible treatment variance to dispose of soil without treatment due to the low levels of contamination to be removed. The Navy would apply for a waiver if necessary or appropriate as discussed in Section 2.2.7.2 and as presented in EPA Enclosure 3. At this time, it has not been determined whether the waste is classified as RCRA hazardous or non-RCRA hazardous waste. This information is necessary to determine whether the soil will be placed in a California Class I Landfill or incinerated at a facility outside of California. Because the classification of the waste cannot be determined at this time, it was assumed that the waste would be classified as RCRA hazardous waste for the purposes of this FS.

4. **EPA Comment:** **Table 5-1, Comparison of Remedial Alternatives: It is unclear how Alternative 2: Excavation and Off-site Disposal, would result in an equivalent reduction of toxicity, mobility, and volume as leaving the contaminated soil in place. It is U.S. EPA's opinion that removal of contaminated soil would, in fact, result in greater reduction in toxicity, mobility and volume (particularly if the soil is incinerated prior to disposal). Please correct this discrepancy.**

Response: Section 4.11 of the text and Table 5-1 have been revised to indicate that the toxicity, volume, and mobility of contaminants at the site will be reduced by excavation and incineration and incineration of the contaminated soil.

5. **EPA Comment:** **Appendix B, Alternative 2: Land Use Controls: Since Alternative 2 will result in waste being left on site, the Five-Year Review provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) will be triggered. To provide a more accurate comparison to Alternative 3, please provide costs for preparing the five-year review for Site 27 in the cost estimate for Alternative 2. In addition, the cost of the field engineer appears to be an unloaded cost. Please revise the cost estimate to use a loaded cost (probably in the $75 an hour range) for the field engineer. Additionally, the 10 hour estimate for travel, the site walk and reporting also seems low, although it is probably acceptable for this level of cost estimating. Finally, per Office of Management and Budget (OMB) OMB Circular No. A-94, Appendix C, the correct discount rate for use on federal projects is 3.9%. Please revise the cost estimate to use this discount rate rather than 7%.**

Response: Alternative 2 has been revised to include the costs associated with a 5-year engineering review report. The costs for a mid-level engineer have been included in the estimate to complete the annual site inspection and the hours for the site inspection were increased. The discount rate has been updated from 7 to 3.9 percent.

6. **EPA Comment:** **Appendix B, Alternative 3, Excavation and Disposal: More than three quarters of the cost of Alternative 3 are for waste disposal at a Class 1 hazardous waste landfill. However, there is nothing in the text that indicates that the materials that would be excavated are hazardous wastes. Please revise the cost estimate to provide further clarification explaining why the excavated soils would have to be disposed of in a hazardous waste landfill, or to consider other disposal options (see Enclosure 3).**

Response: Section 3.3.3 of the text has been revised to provide further clarification on disposal options. Section 4.3 has been revised to specify that for purposes of the cost estimate, it was assumed that soil would be treated at the Port Arthur Facility in Texas.

7. **EPA Comment:** **Appendix B, Alternative 3, Excavation and Disposal: The cost of disposal at the Port Arthur Landfill (in Texas) is indicated to be $1,600 per ton, which appears to be an incineration cost. Please revise the report to clarify why the soils, which do not appear to be characteristically hazardous, would need treatment, let alone incineration. Additionally, please revise the report to indicate why the waste would have to be shipped to Texas for disposal rather than to a landfill in California. As part of this clarification to the revised FS, please indicate how the soils from the underground storage tank excavation, which included two of the highest pesticide concentrations detected at the site, were disposed of.**

Response: See response to EPA General Comment 1 above for clarification on the classification of the waste. Soil from the underground storage tank (UST) removal, which was classified as non-regulated petroleum contaminated soil, was disposed of at the B and J Landfill, a Class II landfill, at 6426 Hay Road, Vacaville, CA 95687 (KTW Associates 1997). Composite soil samples from the stockpile were collected in April 1997 and submitted for analysis of total petroleum hydrocarbons (TPH)-diesel; benzene, toluene, ethylbenzene and xylenes (BTEX); pesticides; and polychlorinated biphenyls (PCB). The report indicates that "relatively low levels (4.3 to 12 parts per billion [ppb]) of organochlorine pesticides chlordane, 4,4'-DDT, and endrin were present in the soil samples (KTW Associates 1997). BTEX was not detected, and TPH-diesel was detected at concentrations of 88 and 89 parts per million (ppm). The report also indicated that three samples collected from one boring advanced southwest of the UST at depths of 7.5, 11 and 16 feet bgs, and two samples collected from the bottom of the excavation did not contain pesticides or PCBs (KTW Associates 1997).

8. **EPA Comment:** **Appendix B, Alternative 3: U.S. EPA is unclear on the Navy's proposal to collect 36 soil samples to characterize soils prior to excavation, as it implies insufficient site characterization sampling has occurred during the Remedial Investigation. A more cost effective proposal would be to include sufficient post-excavation confirmation samples and waste characterization samples.**

Response: The FS text in Appendix B has been revised to assume that up to 19 soil samples will be necessary to complete the post excavation confirmation sampling and waste characterization. The post confirmation soil samples will be collected on 20-foot centers (16 total) within the excavated area. The excavated area, which is shown on Figure 2-3 of the FS, includes the area surrounding and beneath the building. One soil sample will be collected per 100 cubic yards of soil removed for waste characterization (four total).

9. **EPA Comment:** **Appendix B, Alternative 3: Text on page B-2 indicates 3,000 cubic feet (or approximately 110 cubic yards) of soil is assumed to be excavated. However, in the subsequent table, a volume of 330 cubic yards (with a corresponding weight of 495 tons) is used. Please correct this discrepancy.**

Response: The volume of contaminated soil is estimated to be 330 cubic yards of soil (495 tons). The text on page B-2 indicates that 3,000 square feet of soil to a depth of 3 feet will be excavated. This also translated to approximately 330 cubic yards of soils:

$3000\ ft^2 \times 3$ feet= $9{,}000\ ft^3$; $9000\ ft^3 / 27\ ft^3/yd^3 = 333$ cubic yards

Thus, it does not appear the text needs to be revised.

RESPONSE TO COMMENTS FROM SFBRWQCB

SFBRWQCB General Comments

1. **SFBRWQCB Comment:** **The soil/ aqueous mobility of the chemicals of concern resident to the soils at the site has not been characterized adequately. In addition, the chemical/ physical interactions between petroleum hydrocarbons and other site-specific chemicals of concern in the unsaturated zone are not presented in this report. Moreover, the Navy needs to improve site use documentation such as the purpose of the drainage swale, the location of the vadose zone monitoring well. Board Staff understands that the computed HQs (site related hazard quotients for chemical is) do not indicate that under the anticipated land use scenario site 27 poses unacceptable risks to human health. However, potential exceedances were found under the industrial/ commercial scenario at buildings IA-20 and IA 36. These exceedances were driven by carcinogenic risks to human health. For example, Board Staff is specifically concerned by the spatially heterogeneous distribution of sites contaminants. Detections of alpha/ gamma chlordane in surface soils at the site exceed (at three sampling sites) the 2.9 ppm risk based screening level for this compound assuming groundwater potability and industrial land-use. Aroclors concentrations were found to exceed the risk based screening levels for Polychlorinated Biphenyls (1.0 mg/kg) at one site. Finally, contamination extent and associated ecological/ hydrological risks were not evaluated below buildings IA-20 and IA-36. Board Staff is recommending that the Navy characterize potential impairment to surface and groundwater quality at site 27. In the event this investigation effort has already been conducted the sampling protocol and associated data should be**

integrated in this report. This recommendation is additionally supported from interests expressed by the public community at a Restoration Advisory Board meeting held at the Ambrose Community Center in Bay Point, CA on November 4th 2002.

Response:

The Navy believes the site has been adequately characterized based on surface and subsurface soil samples collected during the site inspection (SI) and remedial investigation (RI). Four of the 23 surface soil samples contained constituents of concern (COC) (pesticides and polychlorinated biphenyls [PCB]) above the residential EPA Region IX preliminary remediation goals (PRG). No compounds were detected in subsurface soil samples above the residential PRGs, including the areas where the surface exceedances were observed. This suggests that the COCs have not migrated to the subsurface and is consistent with the fate and transport of the COCs, which are relatively immobile and are likely to bind the silty clay soil present at the site. According to the Agency for Toxic Substances and Disease Registry (ASTDR) website, chlordane sticks strongly to soil particles at the surface and is not likely to enter the groundwater (ASTDR 2003). Because the COCs are present in surface soil only, there is no evidence of migration at depth. Also, because depth to groundwater at the site is relatively deep (at least below 25 feet bgs), there is no need to sample groundwater at the site. This is discussed further in the FS in Section 2.2.6.

Soil impacted by TPH-diesel from the leaking former UST at the site was considered substantially removed (KTW & Associates 1997). The Contra County Health Services Department issued a letter to the Navy recommending no further action for the site on February 13, 1998 (Contra County Health Services Department 1998). Thus, TPH is not expected to be of concern.

The drainage swale is a low-lying, unimproved area at the site where surface rainwater runoff drains. The location of the vadose zone well is shown on Figure 2-2. No additional information was located regarding the vadose zone well.

A PRG-based human health risk assessment was conducted at the site using the EPA Region IX PRGs, and the risks were found to be acceptable for human health under the anticipated future land use scenario. As discussed in the California SFBRWQCB guidance (SFBRWQCB 2001), the EPA Region IX PRGs are intended to address human health concerns regarding direct exposure with impacted soil and generally do not consider impact to groundwater or address ecological concern.

The Navy agrees that the concentrations of chlordane and PCBs exceed the risk based screening levels (RBSL) developed by the SFBRWQCB at three locations and one location, respectively, under the condition for (1) surface soil contamination present at less than or equal to 3 meters below ground surface (RBSL Tables A and B) and (2) groundwater which is considered either potable or non-potable (RBSL Tables A and B) (SFBRWQCB 2001). While these concentrations exceed the RBSLs, the Navy believes that the conservative assumptions used in the development of the EPA PRGs are adequate to address human health risk at the site under the CERCLA program.

The Navy does not believe that the COCs pose a threat to groundwater and surface water quality based on the fact that the chlordane and PCBs present in surface soil are relatively immobile (ASTDR 2003) and the depth to groundwater at the site is at least greater than 25 feet bgs.

The distribution of pesticides at the site is discussed in Section 2.2.5.6 of the FS. The pattern of pesticide detections in soil indicates that pesticides were probably used for surface application. There is no evidence of pesticide disposal or significant off-site pesticide migration. PCBs were detected infrequently in soil at the site with the highest concentration (up to 1 mg/kg) detected in soil collected along the drainage swale. The source of PCBs is not known.

Further information regarding the distribution of contaminants at the site, migration pathways, and site features are discussed in the "Draft Final Remedial Investigation Report Inland Area Sites 13, 22, 24A, and 27, Naval Weapons Station Concord, CA" (TtEMI 1997).

2. SFBRWQCB Comment: **Navy's position that none of the remedial alternatives proposed in this report including off site disposal would reduce site's toxicity, mobility or volume of contaminants is unclear to Board Staff. The Navy needs to clarify their position on this statement. CERCLA's preference for selecting remedial actions recommends permanent and significant reduction of mobility, toxicity or volume of hazardous substances. The off site disposal does not address the permanency factor of these CERCLA toxicological characteristics. However, site excavation and disposal at an appropriate landfill will consequently reduce the toxicity.**

Response: Section 4.11 of the text and Table 5-1 have been revised to indicate the toxicity, volume, and mobility of contaminants at the site will be reduced by excavation and incineration of the contaminated soil.

REFERENCES

Altamont Landfill, Livermore, California. April 9, 2003. Personal communication between Peggy Rydell of the Altamont Landfill and Penny Wilson of Tetra Tech EM Inc. regarding disposal of the soil at a Class II Facility.

Agency for Toxic Substances and Disease Registry (ASTDR). ASTDR Web Page. http://www.atsdr.cdc.gov/tfacts31.pdf. Viewed on April 22, 2003.

California Regional Water Quality Control Board. Application of Risk-Based Screening Levels and Decision Making to Sites with Impacted Soil and Groundwater. Volume 1 Tier I Lookup Tables. December 2001.

Contra County Health Services Department. 1998. Letter Regarding Closure Report of a UST removal at Building IA 36. From Sue A. Lloyd, Hazardous Materials Specialist. To Lieutenant Eric Nesbit, Assistant Resident Officer in Charge of Construction, NWS SBD Concord.

Kettleman Hills Facility, Kettleman City, CA. April 15, 2003a. E-mail communication between Chris Howard of the Kettleman Hills Facility and Penny Wilson of Tetra Tech EM Inc. regarding disposal of the soil at the Port Arthur Facility.

Kettleman Hills Facility, Kettleman City, CA. April 9, 2003b. Personal communication between Luke Vincent of the Kettleman Hills Facility and Penny Wilson of Tetra Tech EM Inc. regarding disposal of the soil at a Class I Facility and associated costs.

KTW & Associates. 1997. "Report Closure of Underground Storage Tanks Site IA36, Naval Weapons Station Concord, CA." November.

Tetra Tech EM Inc. (TtEMI). 1997. "Draft Final Remedial Investigation Report Inland Area Sites 13, 22, 24A, and 27, Naval Weapons Station Concord, CA." October.

Weston Solutions. 2003. "E-mail Correspondence between Amado Andal, Environmental Engineer, Weston Solutions and Penny Wilson of Tetra Tech EM Inc. regarding the disposal of Soil from the UST at Site 27," April 14.

ENCLOSURES TO EPA COMMENTS DATED DECEMBER 27, 2002

ENCLOSURE 1

California Health and Safety Code, Section 25157.8. (a) Except as provided in subdivision (c), on and after January 1, 1999, no person shall dispose waste that contains total lead in excess of 350 parts per million, copper in excess of 2500 parts per million, or nickel in excess of 2000 parts per million to land at other than a class I hazardous waste disposal facility, unless the waste is disposed at the site of generation pursuant to express approval of the regional water quality control board granted prior to August 21, 1998, and the waste was classified as nonhazardous at that time, until both of the following occur: (1) The appropriate California regional water quality control board has amended the solid waste facility's waste discharge requirements to specifically allow disposal of the waste. (2) The appropriate local enforcement agency has revised the solid waste facility permit of the facility to specifically allow this disposal pursuant to Chapter 3 (commencing with Section 44001) of Part 4 of Division 30 of the Public Resources Code. (b) Except as provided in subdivision (c), no person shall dispose any material to land at other than a class I hazardous waste disposal facility, if the material is regulated as a hazardous waste by the department, until all of the following have occurred: (1) The department has issued a variance pursuant to Section 25143 to specifically allow disposal of the material to a disposal facility other than a class I hazardous waste disposal facility. (2) The appropriate California regional water quality control board has amended the solid waste facility's waste discharge requirements to specifically allow disposal of the material. (3) The appropriate local enforcement agency has revised the solid waste facility permit of the facility at which the material is proposed to be disposed to specifically allow this disposal pursuant to Chapter 3 (commencing with Section 44001) of Part 4 of Division 30 of the Public Resources Code. (c) This section does not apply to any of the following: (1) Wastes that are disposed of pursuant to a variance issued by the department prior to August 21, 1998. (2) Wastes that are disposed of pursuant to a variance issued by the department and that the department classified and managed as a "special waste" pursuant to regulations adopted by the department that were in effect on August 21, 1998. (3) Wastes disposed of

the disposal of lead contaminated soil, if the disposal is only within the operating right-of-way of an existing highway, as defined in Section 23 of the Streets and Highways Code. This paragraph applies to lead-contaminated soil that is moved from one project to another only if the lead-contaminated soil remains within the designated, contiguously contaminated corridor and within the same transportation district for which the department has specifically issued the variance. (d) This section does not exempt any state or local agency, or any other person, from any conditions or requirements of a California regional water quality control board, or any other agency, that may be placed on the reuse or disposal of waste pursuant to a variance issued by the department. (e) This section shall remain in effect until July 1, 2006, and as of that date is repealed unless a later enacted statute repeals or extends that date.

ENCLOSURE 2

From Title 22 of the California Code of Regulations

§66268.44. Variance from a Treatment Standard.
(a) Based on a petition filed by a generator or treater of RCRA hazardous waste, the USEPA Administrator may approve a variance from an applicable treatment standard if:

(1) It is not physically possible to treat the waste to the level specified in the treatment standard, or by the method specified as the treatment standard. To show that this is the case, the petitioner shall demonstrate that because the physical or chemical properties of the waste differ significantly from waste analyzed in developing the treatment standard, the waste cannot be treated to the specified level or by the specified method; or

(2) It is inappropriate to require the waste to be treated to the level specified in the treatment standard or by the method specified as the treatment standard, even though such treatment is technically possible. To show that this is the case, the petitioner shall either demonstrate that:

(A) Treatment to the specified level or by the specified method is technically inappropriate (for example, resulting in combustion of large amounts of mildly contaminated environmental media); or

(B) For remediation waste only, treatment to the specified level or by the specified method is environmentally inappropriate because it would likely discourage aggressive remediation.

the applicant shall petition the U.S. EPA Administrator for a variance from a treatment standard pursuant to 40 CFR Section 268.44. Within 30 days after the applicant has received from the U.S. EPA Administrator an approved variance from a treatment standard, the applicant shall submit to the Department a copy of the approved variance.

ENCLOSURE 3

Cost Estimate and Supporting Information for Alternative 3: Excavation and Off-site Disposal

Cost Estimate

If the Navy is granted a treatability variance and allowed to dispose of soils from Site 27 soils at a Class I (hazardous waste) landfill without treatment, the cost of this alternative will be approximately $351,000.

This cost is based on the costs shown in Appendix B to the Focused Feasibility Study for Alternative 3, with the following adjustments: 1) transportation costs adjusted to $12,000 (assumes 12 loads of 37.5 tons of soil per load) 2) $50/ton tipping fees at the Waste Management Kettleman Hills facility. Approximately $75,000 of that cost is for the demolition and disposal of the buildings. However, it is not entirely clear that the cost of demolition and disposal of the buildings, which probably have no economic value and will have to be demolished anyway, should be applied to the Excavation and Off-site Disposal alternative.

Please see the following rationale explaining the basis for U.S. EPA's assumption that the Navy could dispose of soils from Site 27 without treatment.

Rationale

The average total chlordane concentration in surface soils at Site 27 (based on samples collected between the ground surface and 0.5 feet below the ground surface) is below the industrial preliminary remediation goal (PRGi) of 6.4 mg/kg. Two of 23 total surface soil samples were found to have total chlordane concentrations above the PRGi. Based on Table 2-1 in the draft FS, the average total chlordane concentration in the 23 surface soil samples collected at the site is 3.6 mg/kg.

Should Alternative 3: Excavation and Off-site Disposal be selected as the remedial alternative, the soil might require handling as a non-RCRA hazardous waste, since the average total chlordane concentration in the soil exceeds the Total Threshold Limit Concentration (TTLC) for the soil of 2.5 mg/kg (see Title 22 of the California Code of Regulations (CCR) Section 66261.24(a)(2)). If the excavated soil is characterized as a hazardous waste, it would require treatment prior to disposal to meet the land disposal restriction (LDR) standards. The treatment would have to reduce the total chlordane concentrations in the soil to below 10 times the Universal Treatment Standards (UTS) for chlordane - 2.6 mg/kg (see 22CCR 66268.48 and 22CCR 66268.49).

The Best Demonstrated Available Technology (BDAT) for treating chlordane waste is incineration. Hence, if the surface soil at Site 27 is excavated, the Navy is concerned that for the soil to be disposed to land, it would have to be shipped to Port Arthur, Texas for incineration at a cost of $795,500. Based on the regulatory background presented below, U.S. EPA believes this may be unnecessary.

Regulatory Background

It is not U.S. EPA's intent that large quantities of slightly-contaminated soils be incinerated to meet the BDAT UTS. Both the Code of Federal Regulations and the CCR contain provisions for obtaining Treatability Variances to allow for the disposal of slightly contaminated soil to land without having to meet the BDAT UTS. In the Preamble to the 1990 version of the National Contingency Plan (Federal Register, Vol 55, No. 46, March 8, 1990 Page 8741), U.S. EPA indicates:

For example, EPA expects that CERCLA sites will frequently be complying with the terms of the treatability variance under the RCRA land disposal restrictions (LDR) for soil and debris when LDR is an ARAR.

Further on in the preamble (Page 8760), U.S. EPA further clarifies the applicability of the LDR treatment standards to CERCLA wastes:

As discussed in the October 1989 notice, EPA's experience under CERCLA has been that treatment of large quantities of soil and debris containing relatively low levels of contamination using LDR, "best demonstrated available technology" (BDAT) is often inappropriate....Examples of these and other situations reflecting EPA's experience concerning the inappropriateness of incinerating contaminated soil and debris are included in the record for this rule. In addition, as discussed below, EPA has experienced problems in achieving the current noncombustion LDRs for contaminated soil and debris. Based on EPA's experience to date and the virtually unanimous comments supporting this conclusion, EPA has determined that, until specific standards for soils and debris are developed, current BDAT standards are generally inappropriate or unachievable for soil and debris from CERCLA response actions and RCRA corrective actions and closures. Instead, EPA presumes that, because contaminated soil and debris is significantly different from the wastes evaluated in establishing the BDAT standards, it cannot be treated in accordance with those standards and thus qualifies for a treatability variance from those standards under 40CFR268.44.

Obtaining a treatability variance for soils with relatively low levels of contamination is not onerous. The preamble indicates on pages 8761-8762 that:

As discussed earlier, EPA believes that it is unnecessary for petitioners (or the lead Agency in CERCLA response actions) to make site-specific demonstrations that BDAT standards are inappropriate for contaminated soil and debris. The numerous comments and Agency experience supporting a presumption that BDAT standards are inappropriate or not achievable is clearly warranted at this time because the criteria in 40 CFR 268.44 for treatability variances are generally met for soil and debris. As a result, under EPA's established treatability variance procedures (40 CFR 268.44), variance applications for contaminated soil and debris do not need to demonstrate that the physical and chemical properties differ significantly from wastes analyzed in developing the treatment standard, and that, therefore, the waste cannot be treated to specified levels or by specified methods. Petitions need only focus on justifying the proposed alternative levels of performance using existing interim guidance containing suggested treatment levels for soil and debris (Superfund LDR Guidance #6A, "Obtaining a Soil and Debris Treatability Variance for Removal Actions", EPA OSWER Directive 9347.3-06FS, July 1989) as a benchmark.

EPA estimates that the administrative costs of applying for a treatability variance would be on the order of $1,122 per site (see EPA, Economic Impact Assessment of the Phase IV Land Disposal Restriction Final Rule on Newly Identified Wood Preserving Hazardous Wastes Contaminated Media at Inactive and Abandoned Wood Preserving Sites U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, April 15, 1997).

While it is clear that incineration is technically feasible to meet the ten times the UTS standard for the Site 27 surface soils, EPA has also stated that treatment of slightly contaminated soils may be "inappropriate". EPA clarified the meaning of "inappropriate" as applied to remedial technologies for hazardous wastes in the Federal Register (Vol. 62, No. 234, December 5, 1997, Page 64504)

The first circumstance is when imposition of BDAT treatment, while technically possible, remains unsuitable or impractical from a technical standpoint. The chief example is when a treatment standard would result in combustion of large amounts of mildly contaminated soil or wastewater. 55 FR at 8760 and 8761, March 8, 1990; 61 FR at 18806–18808, April 29, 1996 and other sources cited therein.

The second set of circumstances where treatment to the limit of best demonstrated available technology might be inappropriate involves cases where imposition of the otherwise applicable treatment standard could result in a net environmental detriment by discouraging aggressive remediation. The example EPA and authorized states have encountered most often to date is where federal rules allow the option of leaving wastes in place,[14] Another recent example of such a treatment variance was granted to Dow Chemical Co. by EPA Region V. In this case, the company could legally leave wastes within an area of contamination but requested instead that the wastes be exhumed for more secure disposal in a subtitle C landfill. Viewing this as a net environmental benefit, and further finding that no other treatment but combustion was available to reduce the relatively low levels of hazardous constituents (chlorinated dibenzo-dioxins and furans), the Region found the existing treatment requirement inappropriate and granted the variance. Treatment Variance for Dow Chemical Co., June 10, 1997, Response to Comment Document pp. 15–17. and a facility then has the choice of pursuing the legal option of leaving the wastes in place or opting to excavate thereby triggering treatment to standards based on the performance of best demonstrated available technology, which can be very expensive. 62 FR at 26059, May 12, 1997, and other sources there cited.[4] In these circumstances, a treatment variance can provide an intermediate option of more aggressive remediation, which may include substantial treatment of the removed waste before disposal of that treatment residue—a net environmental benefit over leaving untreated waste in place. 61 FR at 55720–22, May 12, 1997. In EPA's experience, this situation often occurs when BDAT treatment would require that wastes be treated to achieve constituent concentrations that fall below protective site-specific cleanup levels, thus increasing remediation costs for treatment of excavated wastes. In these instances, EPA has indicated that consideration of a treatment variance is typically warranted (because imposition of the otherwise applicable treatment standard would discourage aggressive remediation and is, therefore, inappropriate) and that, if a variance is approved, protective, site-specific cleanup levels may be used as alternative LDR treatment standards. See recent EPA guidance on LDR treatment variances: Jan 8, 1997 memorandum, ''Use of Site-Specific Land Disposal Restriction

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13 Examples are where wastes can remain within an ''area of contamination'', where remedy selection requirements allow a balancing of treatment and containment strategies and where RCRA regulations allow the option of closing a regulated unit with wastes left in place.

Treatability Variances Under 40 CFR 268.44(h) During Cleanups'' from Michael Shapiro, Director EPA Office of Solid Waste and Steve Luftig, Director EPA Office of Emergency and Remedial Response and information on compliance with statutory provisions for LDR treatment, below. In addition, see ''Hazardous Waste: Remediation Waste Requirements Can Increase the Time and Cost of Cleanups'' U.S. General Accounting Office, GAO/RCED– 98–4, October 1997. EPA is accordingly codifying qualifying language stating that treatment variances can be granted where the underlying standard is not appropriate either because it is technically inappropriate or because requiring LDR treatment is environmentally inappropriate in that it could discourage aggressive remediation.

This logic has been incorporated in Title 22 of the CCR:

§66268.44. Variance from a Treatment Standard.

(a) Based on a petition filed by a generator or treater of RCRA hazardous waste, the USEPA Administrator may approve a variance from an applicable treatment standard if:

(1) It is not physically possible to treat the waste to the level specified in the treatment standard, or by the method specified as the treatment standard. To show that this is the case, the petitioner shall demonstrate that because the physical or chemical properties of the waste differ significantly from waste analyzed in developing the treatment standard, the waste cannot be treated to the specified level or by the specified method; or

(2) It is inappropriate to require the waste to be treated to the level specified in the treatment standard or by the method specified as the treatment standard, even though such treatment is technically possible. To show that this is the case, the petitioner shall either demonstrate that:

(A) Treatment to the specified level or by the specified method is technically inappropriate (for example, resulting in combustion of large amounts of mildly contaminated environmental media); or

(B) For remediation waste only, treatment to the specified level or by the specified method is environmentally inappropriate because it would likely discourage aggressive remediation.

(b) For hazardous waste subject to RCRA land disposal restrictions set forth in article 4 of this chapter, the applicant shall petition the U.S. EPA Administrator for a variance from a treatment standard pursuant to 40 CFR Section 268.44. Within 30 days after the applicant has received from the U.S. EPA Administrator an approved variance from a treatment standard, the applicant shall submit to the Department a copy of the approved variance.

It is not entirely clear if the Site 27 soil would be a RCRA hazardous waste (no toxicity characteristic leaching potential [TCLP] results are presented) as well as a non-RCRA (California hazardous only) waste. In the latter case, only a variance from the state would be required. There is precedent for obtaining treatability variances from the state for chlordane-impacted soils. The Department of Toxic Substances Control (DTSC) gave a treatability variance for the disposal of 300 cubic yards of soil impacted by chlordane, diazinon and Sevin at the Pacific Pest Control site in Oxnard, California (see http://www.dtsc.ca.gov/database/Calsites/CALP001.CFM?IDNUM=56070001)