Final

Record of Decision for Installation Restoration Site 22A

Former Naval Weapons Station Seal Beach Detachment Concord Concord, California

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Base Realignment and Closure
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ACRONYMS AND ABBREVIATIONS

§	Section
AR	Administrative Record
ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
BHHRA	Baseline human health risk assessment
BRAC	Base Realignment and Closure
Cal. Code Regs.	California Code of Regulations
CAMU	Corrective action management unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of concern
COPC	Chemical of potential concern
COPEC	Chemical of potential ecological concern
DTSC	Department of Toxic Substances Control
EC	Engineering controls
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FFA	Federal Facility Agreement
FS	Feasibility Study
GRA	General response action
HI	Hazard index
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	Hazard quotient
IAS	Initial Assessment Study
IC	Institutional controls
IR	Installation Restoration
LUC	Land use control
mg/kg	Milligram per kilogram
MOA	Memorandum of agreement
MRP	Munitions Response Program

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NAVWPNSTA	Naval Weapons Station Seal Beach Detachment
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No further action
NPL	National Priorities List
O&M	Operation and maintenance
PBC	Public benefit conveyance
PRG	Preliminary remediation goal
RAB	Restoration Advisory Board
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RI	Remedial Investigation
RMR	Risk management range
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SLERA	Screening-level ecological risk assessment
tit.	Title
TRV	Toxicity reference value
Water Board	San Francisco Bay Regional Water Quality Control Board

1.0 DECLARATION

This Record of Decision (ROD) presents the remedy selected by the Department of the Navy and the U.S. Environmental Protection Agency (EPA) for Installation Restoration (IR) Site 22A at the former Naval Weapons Station Seal Beach Detachment Concord (NAVWPNSTA Concord) located in Concord, California (Figure 1). IR Site 22A consists of five separate groups of munitions storage magazines, referred to as Magazine Groups 1 through 5. Former NAVWPNSTA Concord was included on the National Priorities List (NPL) in 1994 (EPA ID: CA7170024528). The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (Title 42 *United States Code* Section [§] 9601, et seq.) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 *Code of Federal Regulations* Part 300). The State of California concurs with the selected remedy. The decision documented in this ROD is based on the Administrative Record (AR) file. Information that is not specifically summarized in this ROD or its references but that is contained in the AR[1] has been considered and is relevant to the selection of the remedy at IR Site 22A.

The remedy selected in this ROD is necessary to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment. The Navy's Base Realignment and Closure (BRAC) Program Office provides funding for site remediation at the former NAVWPNSTA Concord. The Federal Facility Agreement (FFA) for the former NAVWPNSTA Concord documents how the Navy, as the lead federal agency, intends to meet and implement the requirements of CERCLA in consultation with EPA and the state supporting agencies, the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board).

Former NAVWPNSTA Concord was initially developed for military use during World War II and contains numerous potential sources of contamination. Environmental investigations began at the five magazine areas within IR Site 22A in December 2005 with a Site Investigation (SI) that included surface soil sampling for analysis of arsenic. The results of the SI showed a distribution of arsenic at IR Site 22A consistent with application of an herbicide around structures. Arsenic concentrations in soil near the magazine structures were above the background concentration (10 milligrams per kilogram [mg/kg]), while arsenic concentrations within the open areas of the site (with no structures) were below the background concentration. Based on the Remedial Investigation (RI) findings, including a baseline human health risk assessment (BHHRA), a Feasibility Study (FS) was conducted to address the risks to human health associated with future residential exposure to arsenic-contaminated surface soil at IR Site 22A Groups 2 through 5 Magazine Areas. No further action was recommended for the Group 1 Magazine Area because arsenic concentrations were below background levels. Although arsenic concentrations exceeded background levels in Magazine Groups 2 and 4, they

[1] **Bold blue text** identifies detailed site information available in the Administrative Record and listed in the References Table (Appendix C). This ROD is also available on CD, whereby **bold blue text** serves as a hyperlink to reference information. To the extent there may be any inconsistencies between the reference information attached to this ROD via hyperlinks and the information in the basic ROD itself, the language in the basic ROD controls.

were below the remedial goal of 22 mg/kg. Concentrations of arsenic in surface soil (the upper 6 inches of soil) exceed the remedial goal at Magazine Groups 3 and 5. As a result, the Navy has concluded that no action is needed at Magazine Groups 1, 2, and 4 and that land use controls (LUC) are necessary at Magazine Groups 3 and 5 to protect public health or welfare.

The overall strategy for the Inland Area of former NAVWPNSTA Concord is to implement all appropriate response actions so that the facility no longer poses a threat to human health and the environment. The response actions at the site will occur in discrete locations called IR or Munitions Response Program (MRP) sites identified at the facility pursuant to the FFA. When no further response is necessary, the Inland Area will be delisted from the NPL. This ROD documents the final remedy for IR Site 22A and does not include or affect any other sites at the facility.

1.1 SELECTED REMEDY

The selected remedial action addresses arsenic contamination in soil. The remedy includes no action at Magazine Groups 1, 2, and 4; and LUCs to restrict use at Magazine Groups 3 and 5. Arsenic contamination in surface soil does not pose an unacceptable risk to human health or the environment in Magazine Groups 1, 2, and 4. Additionally, arsenic in surface soil at IR Site 22A is limited in extent and is relatively immobile. Therefore, no action is necessary to ensure protection of human health and the environment at Magazine Groups 1, 2, and 4. However, LUCs are the selected remedy for Magazine Groups 3 and 5, as they will prohibit residential reuse to limit potential human exposure to arsenic-contaminated surface soil, where the exposure point concentration is above the remedial goal for these activities. Residential reuses that will be prohibited include residential use, hospitals (other than veterinary hospitals), schools for persons under 21 years of age, day care centers for children, and playgrounds. Open space parkland and other recreational reuse activities will not be prohibited. Additionally, monitoring and inspection would be conducted to ensure that the LUCs are being maintained. Implementation of this remedial alternative would not preclude further response actions by future landowners or developers. LUCs may be modified, resulting in a less-restricted use, or terminated, which would allow for unrestricted reuse. Any modification or termination of the LUCs will require the approval of the Navy and the regulatory agencies.

The selected remedial action is protective of human health and the environment, complies with federal and state statutes and regulations that are legally applicable or relevant and appropriate to the selected remedy, and is cost effective. The selected remedy will obviate the need for further corrective action and satisfy the corrective action requirements under the Resource Conservation and Recovery Act (RCRA) or otherwise applicable state hazardous waste protection laws. The selected remedy does not satisfy the statutory preference to include treatment as a principal element of the remedy. Treatment technologies for arsenic-contaminated soil were evaluated in the FS, and most were not included in a remedial alternative because they were determined to be difficult to implement, of limited effectiveness, and potentially very costly.

Since this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unrestricted use and unlimited exposure, a statutory review will be conducted within 5 years after initiation of the remedial action (finalization of the LUC

Remedial Design [RD]) to ensure that the remedy remains protective of human health and the environment.

1.2 DATA CERTIFICATION CHECKLIST

The following information is included in Section 2.0 of this ROD. Additional information can be found in the Administrative Record file for this site.

- Discussion of the overall site strategy and how the response action at IR Site 22A fits into it (Section 2.1).
- Chemical of concern (COC) and its concentrations (Sections 2.3 and 2.5).
- Current and reasonably anticipated future land use assumptions (Section 2.4).
- A description of baseline risk represented by the COC (Section 2.5).
- The remediation goal established for the COC and the basis for this goal (Sections 2.5 and 2.7).
- A discussion of principal threat wastes (Section 2.6).
- Estimated capital, annual operation and maintenance (O&M), and total present-worth costs; discount rate; and the number of years over which the remedy cost estimate is projected (Table 3).
- Key factors that led to selecting the remedy (for example, a description of how the selected remedy ranked with respect to the balancing and modifying criteria, highlighting criteria key to the remedy selection) (Section 2.9.1).

1.3 AUTHORIZING SIGNATURES

This signature sheet documents the Navy's and EPA's co-selection of the remedy in this ROD. This signature sheet also documents the State of California's (DTSC and Water Board) concurrence with this ROD.

21 Sept 2015

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Base Realignment and Closure (BRAC) Environmental Coordinator
BRAC Program Management Office West
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30 Sept 2015

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Mr. Charlie Ridenour
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Department of Toxic Substances Control

Date

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Mr. Bruce H. Wolfe
Executive Officer
San Francisco Bay Regional Water Quality Control Board

Date

2.0 DECISION SUMMARY

2.1 SITE DESCRIPTION AND HISTORY

Former NAVWPNSTA Concord is located in north-central Contra Costa County, in Concord, California (Figure 1). Throughout its history and into the 1990s, former NAVWPNSTA Concord was a major port for naval munitions trans-shipment and storage. Historically, NAVWPNSTA Concord consisted of two primary areas separated by Los Medanos Hills: the Inland Area, which is approximately 5,200 acres; and the Tidal Area, which is approximately 7,700 acres. The Inland Area was used primarily for ammunition storage, but also included facilities for maintenance, administration, and housing. The Navy acquired the majority of the Inland Area in 1944, when the Navy's operations in the Tidal Area necessitated more storage and administration capacity.

NAVWPNSTA Concord (EPA ID: CA7170024528) was included on the NPL in 1994 pursuant to CERCLA, as amended by SARA, because past naval operations left hazardous substances on site. The Navy is the lead agency responsible for investigating and addressing the release of CERCLA hazardous substances at NAVWPNSTA Concord. The EPA provides federal oversight of the Navy's CERCLA cleanup activities and selects remedial actions in partnership with the Navy. The DTSC and the Water Board are state supporting agencies that provide input into the Navy's CERCLA cleanup activities and concur with the Navy and EPA's remedial decisions. In 1999, the Inland Area was placed in a reduced operational status, and in November 2005, the Defense BRAC Commission recommended that the Inland Area be operationally closed and eventually transferred from federal ownership. Furthermore, the Tidal Area, along with a portion of the Inland Area, was to be transferred to the Army. Therefore, the Tidal Area and 115 acres of the Inland Area were transferred to the Army on September 30, 2008; this property was renamed Military Ocean Terminal Concord. The Inland Area was declared surplus in March 2007 and was operationally closed in September 2008.

Former NAVWPNSTA Concord is a large federal facility and NPL site that was initially developed for military use during World War II and contains numerous potential sources of contamination. IR and MRP sites have been identified in the Inland Area. IR site investigations have addressed residual contaminants in soils, soil gas, and groundwater associated with former military operations. The primary contaminants at IR sites have been metals in soil and solvents in groundwater. MRP site investigations have addressed the residual explosive and chemical hazards associated with former explosive ordnance disposal and maintenance operations. MRP investigations evaluate and remove any items that may pose an explosive hazard. Most of the items removed to date have been "dummy" or practice rounds with little residual explosive hazard. The following table lists RODs that have been signed for the Inland Area:

Site	ROD Date
SWMUs 2, 5, 7, and 18	July 2010
Site 27	March 2013
Site 17	September 2005

IR Site 22A(1) is located within the central portion of the Inland Area of the former NAVWPNSTA Concord (Figure 2). IR Site 22A encompasses 504 acres divided into five subareas, known as Groups 1 through 5 Magazine Areas, which include 103 munitions storage magazines connected by roads and railroad spurs, and surrounding open grassland. The number of magazines and acreage for each group are as follows:

- Group 1 – 6 magazines; 2.4 acres
- Group 2 – 39 magazines; 154 acres
- Group 3 – 18 magazines; 39 acres
- Group 4 – 20 magazines; 124 acres
- Group 5 – 20 magazines; 185 acres

The magazines in Groups 1 through 5 were constructed during the mid-1940s on agricultural land to support wartime activities. The Navy stored munitions and explosives in the magazines from the mid-1940s to 2001. The **explosive materials(2)** stored within the magazines may have included Composition A, Composition B, Cyclotol, high-melting explosive (HMX) (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine), black powder, and Octols. Each magazine was inspected and certified for closure between February 2000 and March 2001. Closure was defined as "visibly free of all ammunition, explosives, and/or explosive residue"[2]. In March 2007, additional inspection occurred and samples were collected. The After Action Report for the Explosive Hazard Evaluation of Selected Facilities at the Naval Weapons Station Seal Beach Detachment Concord concluded that no residual explosives hazard exists in any of the munitions storage magazines in the Inland Area[3].

In 2010, a historical radiological assessment (HRA) conducted by the Navy concluded that 48 structures in the Inland Area might possibly be impacted by historical uses of radioactive material[4]. Designation of a building as "impacted" in the HRA did not confirm the presence of radioactive material, but indicated that further evaluation should occur because of the possibility for residual radioactivity in excess of natural background or fallout levels. Of the 48 potentially impacted structures identified, 35 were special weapons magazines located within IR Site 22A, Group 2 Magazine Area. The HRA determined that only the concrete structural components of the special weapons storage magazines, not the underlying and surrounding soil, are potentially radiologically impacted[4]; there is no evidence that releases of radiation subject to CERCLA have occurred. The Navy subsequently conducted surveys of the structures in accordance with Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) requirements. The MARSSIM results provide evidence that radiation is not present in excess of USEPA's Federal radiation cleanup standard for unrestricted use determinations. MARSSIM survey data indicate that radiation is not present in excess of the Derived Concentration Guideline Levels (DCGL)

[2] Navy. 2004. "Informal Dispute Resolution Summary and Proposed Sampling at the Magazine Area and Installation Restoration Sites 22, 27, and 29 at Naval Weapons Station Seal Beach, Detachment Concord, Concord, California. March 15.
[3] Naval Surface Warfare Center. 2007. After Action Report for the Explosive Hazard Evaluation of Selected Facilities at the Naval Weapons Station Seal Beach Detachment Concord in Concord California. August.
[4] Naval Sea Systems Command (NAVSEA). 2010. "Final Historical Radiological Assessment, Use of General Radioactive Materials 1945 to 2009. Naval Weapons Station Seal Beach, Detachment Concord, Concord, California. March.

release criteria set forth in the Final Work Plan for the Base-wide Radiological Survey[5]. Accordingly, radiation is not a CERCLA contaminant of concern at IR Site 22A. The Navy is documenting these results in survey reports to be approved upon satisfactory reviews by the California Department of Public Health (CDPH) prior to property transfer.

This ROD documents the final remedy for arsenic in surface soil at IR Site 22A and does not include or affect any other IR or MRP sites at the facility. The overall strategy for the Inland Area of former NAVWPNSTA Concord is to implement all appropriate response actions so that the facility no longer poses a threat to human health or the environment. The response actions in the Inland Area will occur in discrete locations called IR or MRP sites identified at the facility pursuant to the FFA. When no further response is necessary, the Inland Area will be delisted from the NPL.

[5] Innovative Technical Solutions, Inc. 2011. "Final Work Plan, Base-wide Radiological Survey, Former Naval Weapons Station, Seal Beach Detachment, Concord, Inland Area, Concord, California", January.

Figure 1. Facility Location

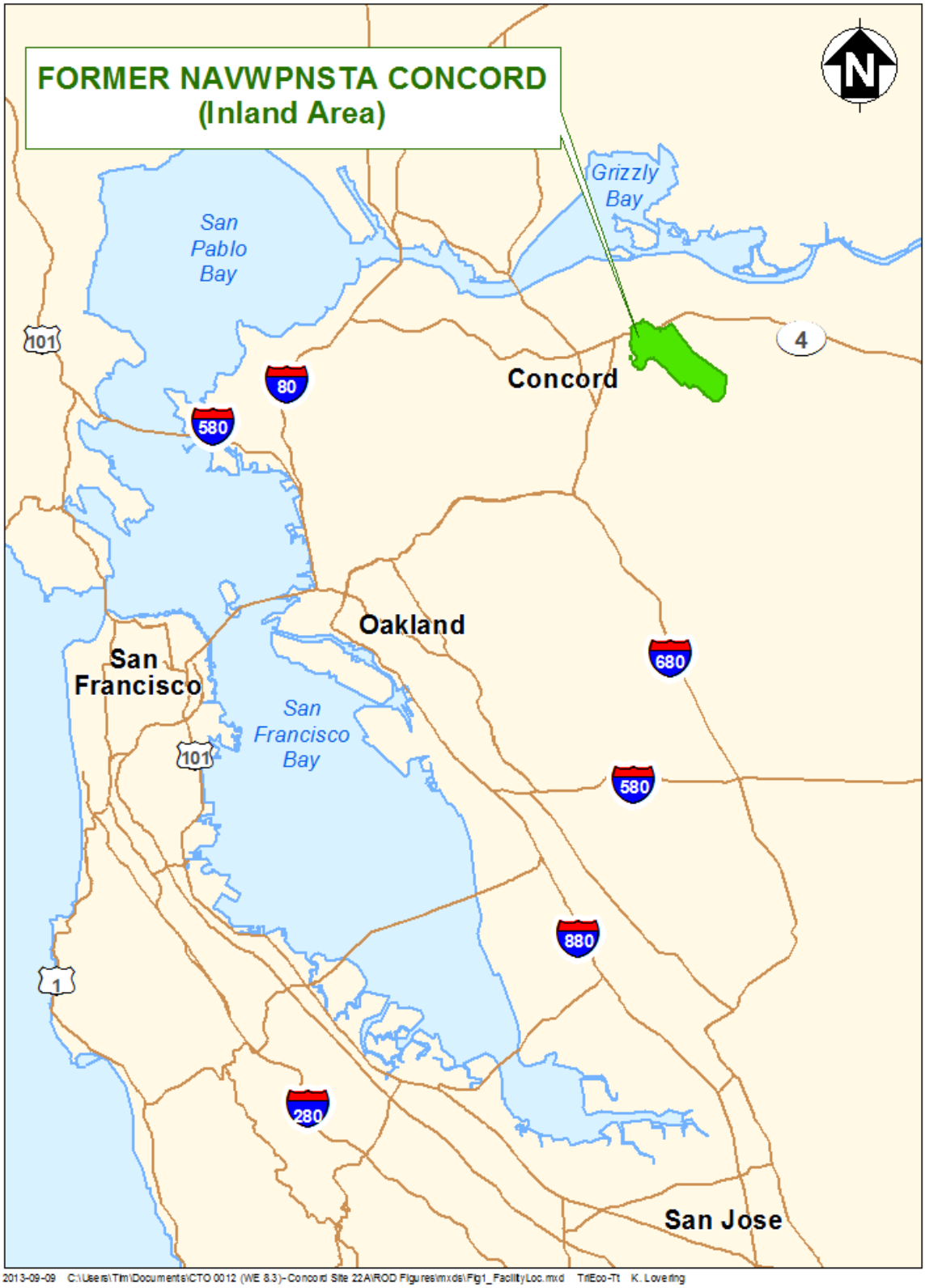
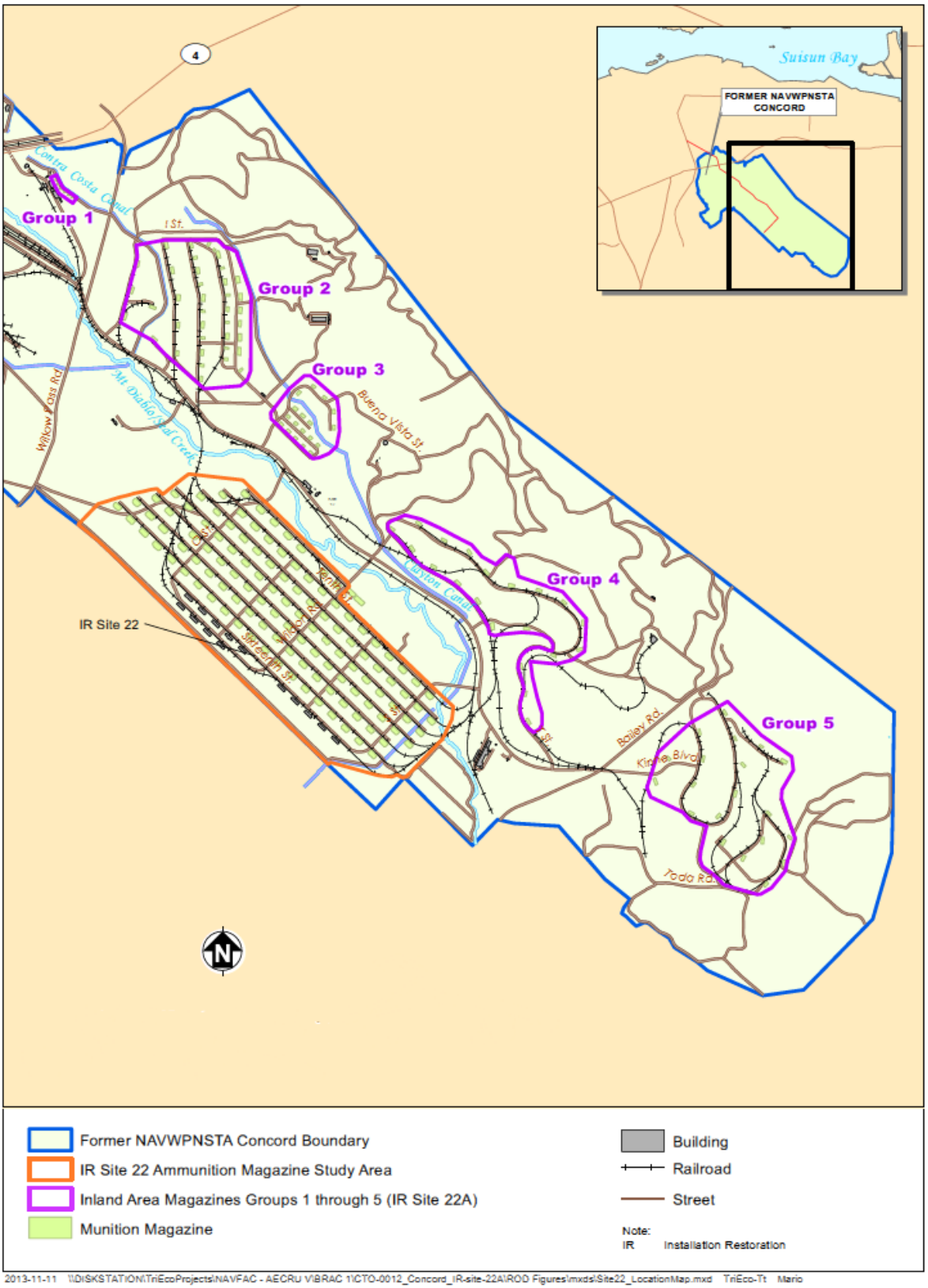


Figure 2. IR Site 22A Layout



2.2 SITE CHARACTERISTICS

IR Site 22A is located on the southwest-facing slopes of Los Medanos Hills and is surrounded by open grassland northeast of Mount Diablo/Seal Creek (Figure 2). Fences exist in and around the magazine areas, as shown in Figures 3 through 7. Clayton Canal, northeast of Mount Diablo/Seal Creek, runs along part of the northeastern boundary of Magazine Group 2 and bisects Magazine Group 3. The Contra Costa Canal runs along the northeast boundary of Magazine Group 1 and through the western portion of Magazine Group 2. There are no other surface waters that pass through any of the magazine groups. Cistern Pond is a surface water body located within the boundaries of Magazine Group 4.

The **regional geology**(3) is a reflection of several northwest-trending fault systems that divide Contra Costa County into fault-bounded blocks: up-thrown blocks form the hills, and down-thrown blocks form broad lowlands floored with thick, unconsolidated, Pleistocene alluvial soils eroded from material that makes up the up-thrown blocks. The soil beneath the site generally consists of silty clay and silt with varying amounts of sand and traces of angular gravel.

Groundwater(4) beneath the Inland Area is commonly found in the coarser sand and gravel units of the unconsolidated alluvium at depths between 30 and 50 feet, under semiconfined conditions.

The **ecology**(5) at IR Site 22A includes annual grasslands with munitions magazines, open space, and a network of roads and railroad spurs and has been disturbed through clearing, grazing, burning, grading, and other human activities. Dominant plant species are primarily nonnative or invasive grass species, and various species of birds and mammals have been observed at the site, including the American robin, western meadowlark, deer mouse, and western harvest mouse. Special status species observed at IR Site 22A include the California red-legged frog and the California tiger salamander, both federally listed as threatened; the California tiger salamander is also a state listed threatened species.

2.3 PREVIOUS INVESTIGATIONS

Previous investigations at IR Site 22A to characterize arsenic in soil began in December 2005 after RI activities at nearby IR Site 22 identified elevated concentrations of arsenic in surface soil at that site. Site 22 contains similar munitions storage bunkers, known as Magazine Group 6. The IR Site 22A SI analyzed 30 surface soil samples from Groups 2 through 5 Magazine Areas for arsenic. The results indicated that arsenic concentrations in soil within the open areas between magazines were below the background concentration level (10 mg/kg) established during an RI for Inland Area IR sites in 1997, and that arsenic concentrations in soil within areas near the magazines were above the background concentration level. These findings were consistent with the working hypothesis that arsenic-containing herbicides had been applied around the magazines to control the fire hazard from vegetation.

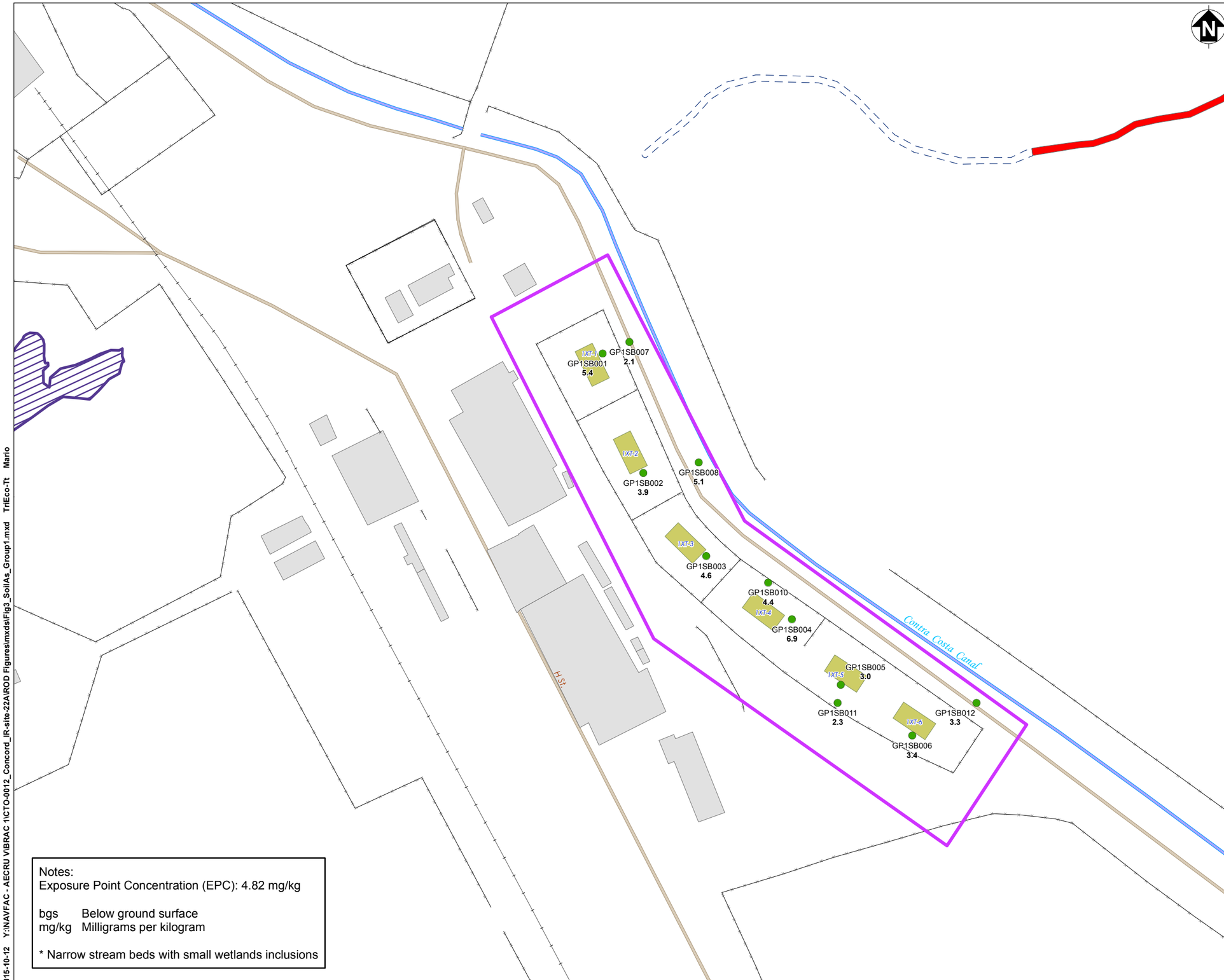
The IR Site 22A RI determined whether arsenic-containing herbicides had been applied at Groups 1 through 5 Magazine Areas and whether arsenic has migrated to groundwater or via surface runoff. The RI included two soil sampling events: Tier 1 in August 2007, and Tier 2 in

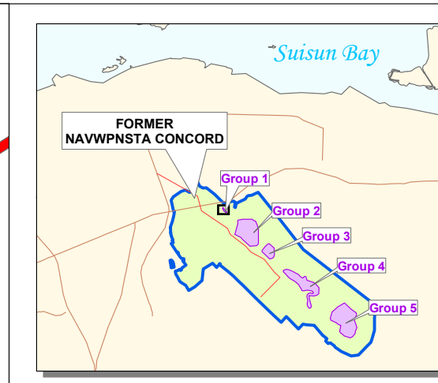
January 2008. Surface soil samples (0 to 0.5 foot below ground surface [bgs]) were collected at random locations for the Tier 1 sampling event near the munitions magazines and from selected open-space locations, including areas adjacent to rail lines. Based on an evaluation of the Tier 1 soil sampling results, Tier 2 samples were collected from: (1) ditches downslope of the munitions magazines, including the inlet and outlet of Cistern Pond, (2) subsurface soil at locations with the highest concentrations of arsenic, and (3) locations along the fence lines.

Analytical results(6) from the soil samples collected within the magazine areas as part of the RI Tier 1 and Tier 2 sample events were combined with the results from the surface soil samples collected during the 2005 SI. The combined results showed a distribution of arsenic at IR Site 22A consistent with application of herbicides, as the elevated arsenic concentrations were found only in surface soils within 90 feet of a subset of magazines (Figures 3 through 7). The maximum arsenic concentration detected in surface soil was 69 mg/kg in a sample collected in the Group 5 Magazine Area. Concentrations of arsenic in open areas and at depths greater than 0.5 foot bgs were generally below the background concentration, suggesting that the clayey soils at IR Site 22A have limited the leaching and downward mobility of arsenic from surface soil to subsurface soils and groundwater. Therefore, groundwater is not considered to be affected by site sources of arsenic, and an investigation of arsenic in groundwater was not required for the RI. Arsenic concentrations detected across the site were as follows:

- Arsenic concentrations in soil throughout Group 1 Magazine Area were below the background concentration level.
- Arsenic concentrations in soil throughout Groups 2 through 5 Magazine Areas were generally below the background concentration level at depths greater than 0.5 foot bgs.
- Arsenic concentrations above the background concentration level were found within the upper 0.5 foot of surface soil, and arsenic had not leached to subsurface soils or into groundwater.
- Arsenic concentrations in surface soil samples collected from ditches and low-lying areas generally were above the background concentration, indicating possible migration by surface water runoff; however, the data do not indicate extensive migration from the magazine areas that were sprayed with herbicides.
- Sediment samples collected at the inlet (upstream) and outlet (downstream) of Cistern Pond were below both the background soil concentration level and the freshwater sediment screening level for protection of benthic invertebrates.

Based on a review of aerial photographs, in April 2009 EPA requested additional sampling of surface soil southeast of the Group 3 Magazine Area, where it is suspected that hay may have been burned in the past. As a result, in June 2009, five additional surface soil samples were collected southeast of the Group 3 Magazine Area. Analytical results from all five surface soil samples collected during the suspected burn area investigation contained arsenic below the background concentration.





2007 Tier I Sampling Location (0 to 0.5 ft bgs)

Group 1 Magazine Area Boundary

Ammunition Magazine

Former NAVWPNSTA Concord Boundary

Jurisdictional Waters of the U.S.

Jurisdictional Waters w/Wetlands*

Jurisdictional Wetlands

Canal

Building

Street

Railroad

Fence Line

GP4SB001 — Sampling Station ID
4.5 — Arsenic Concentration in mg/kg

Concentration of Arsenic:

Result Less than 10 mg/kg

0 100 200
Feet

TriEco
A Joint Venture

Notes:
Exposure Point Concentration (EPC): 4.82 mg/kg

bgs Below ground surface
mg/kg Milligrams per kilogram

* Narrow stream beds with small wetlands inclusions

FORMER NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

FIGURE 3
CONCENTRATIONS OF ARSENIC IN SOIL, GROUP 1 MAGAZINE AREA

Record of Decision for IR Site 22A

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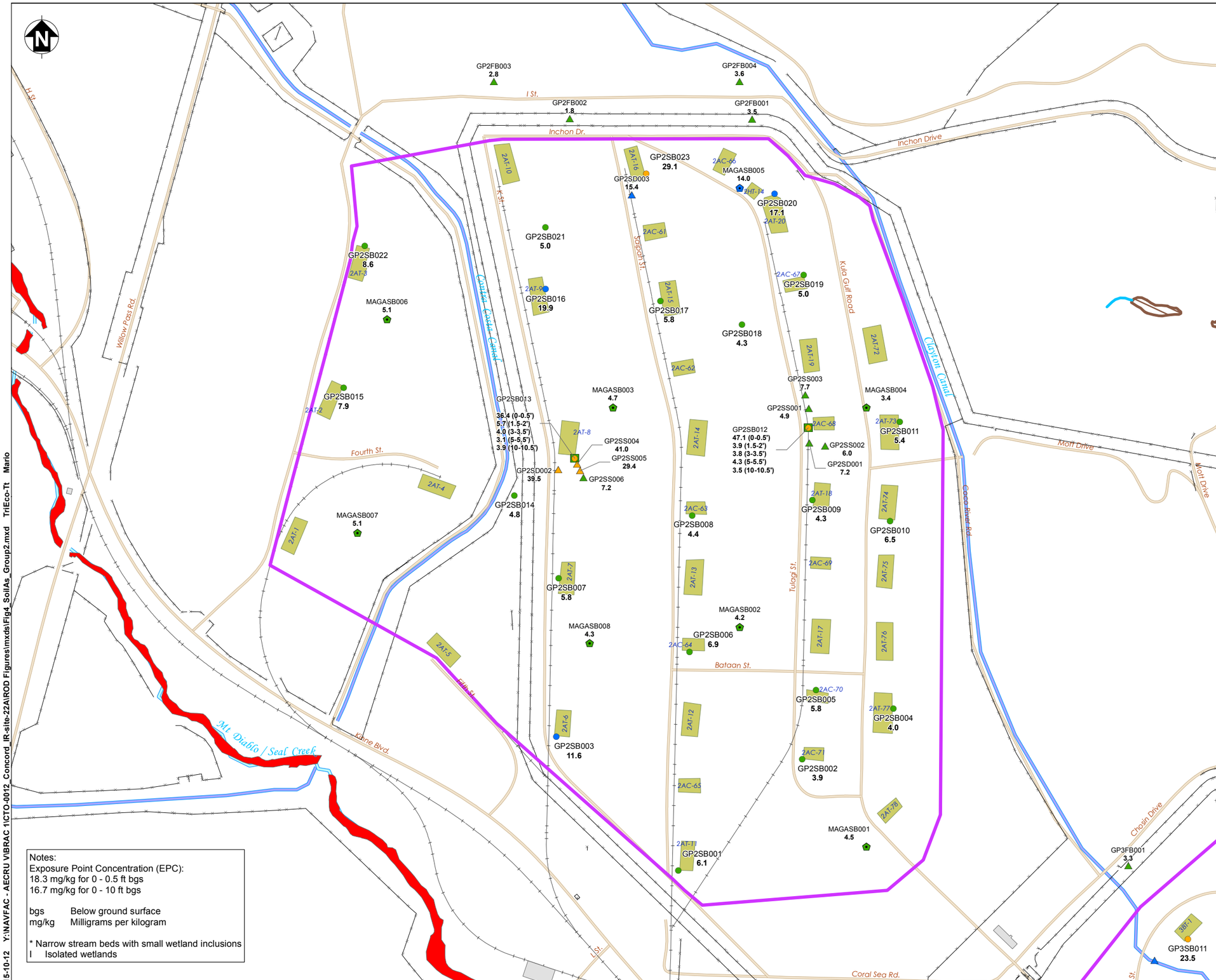
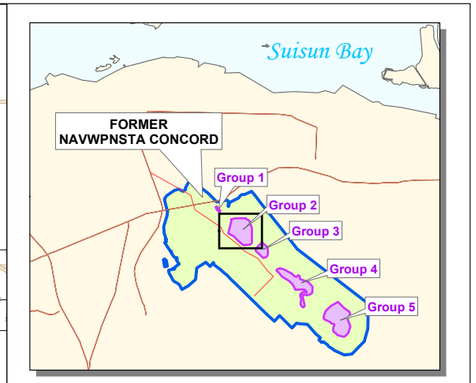


Notes:
Exposure Point Concentration (EPC):
18.3 mg/kg for 0 - 0.5 ft bgs
16.7 mg/kg for 0 - 10 ft bgs

bgs Below ground surface
mg/kg Milligrams per kilogram

* Narrow stream beds with small wetland inclusions
I Isolated wetlands



- 2005 Sampling Location (0-0.5 ft bgs)
- 2007 Tier I Sampling Location (0-0.5 ft bgs)
- 2008 Tier II Sampling Location (0-0.5 ft bgs)
- 2008 Tier II Soil Boring Location
- Ammunition Magazine
- Group 2 Magazine Area Boundary
- Former NAVWPNSTA Concord Boundary
- Jurisdictional Waters w/Wetlands*
- Non-Jurisdictional Waters (I)
- Sec. 1600-1607 California Fish & Game Code
- Building
- Street
- Railroad
- Fence Line

GP2SB004 — Sampling Station ID
4.8 — Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP2SB012 — Sampling Station ID
3.9 (1.5-2') — Sample Depth in feet bgs
Arsenic Concentration in mg/kg

- Results Less than or Equal to 10 mg/kg
- Greater than 10 mg/kg and Less than or Equal to 22 mg/kg
- Greater than 22 mg/kg

0 400 800
Feet

TriEco A Joint Venture

FORMER NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

FIGURE 4
CONCENTRATIONS OF ARSENIC IN SOIL, GROUP 2 MAGAZINE AREA

Record of Decision for IR Site 22A

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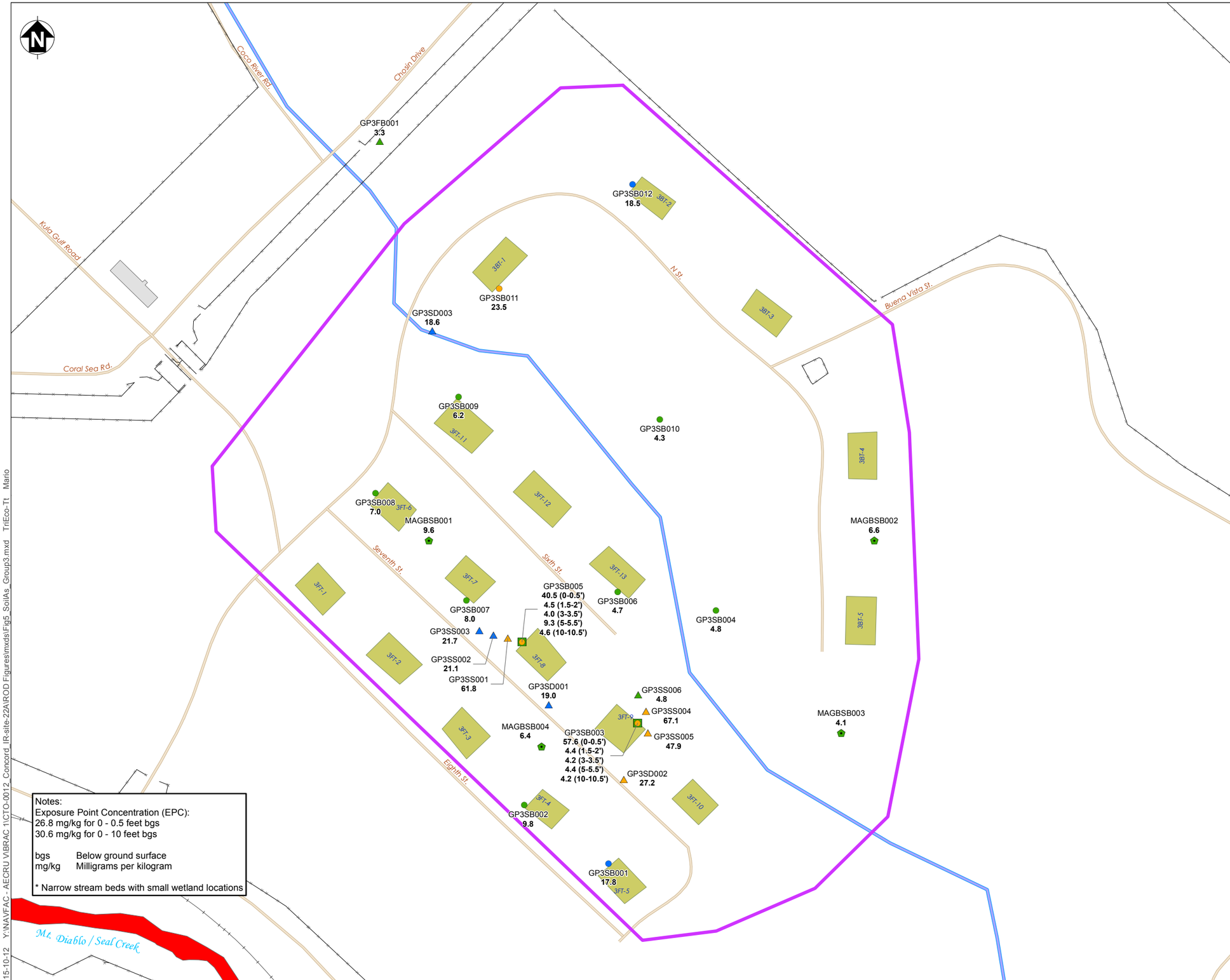
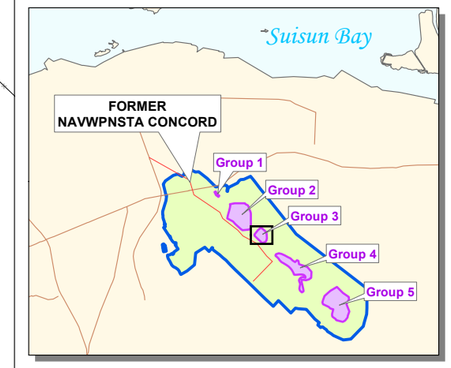


Notes:
Exposure Point Concentration (EPC):
26.8 mg/kg for 0 - 0.5 feet bgs
30.6 mg/kg for 0 - 10 feet bgs

bgs Below ground surface
mg/kg Milligrams per kilogram

* Narrow stream beds with small wetland locations



2005 Sampling Location (0-0.5 ft bgs)
2007 Tier I Sampling Location (0-0.5 ft bgs)
2008 Tier II Sampling Location (0-0.5 ft bgs)
2008 Tier II Soil Boring Location

Ammunition Magazine
Group 3 Magazine Area Boundary
Former NAVWPNSTA Concord Boundary
Jurisdictional Waters w/Wetlands*
Building
Street
Railroad
Fence Line

GP3SB004 — Sampling Station ID
4.8 — Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP3SB005 — Sampling Station ID
4.5 (1.5-2') — Sample Depth in feet bgs
Arsenic Concentration in mg/kg

Results Less than or Equal to 10 mg/kg
Greater than 10 mg/kg and Less than or Equal to 22 mg/kg
Greater than 22 mg/kg

0 200 400
Feet

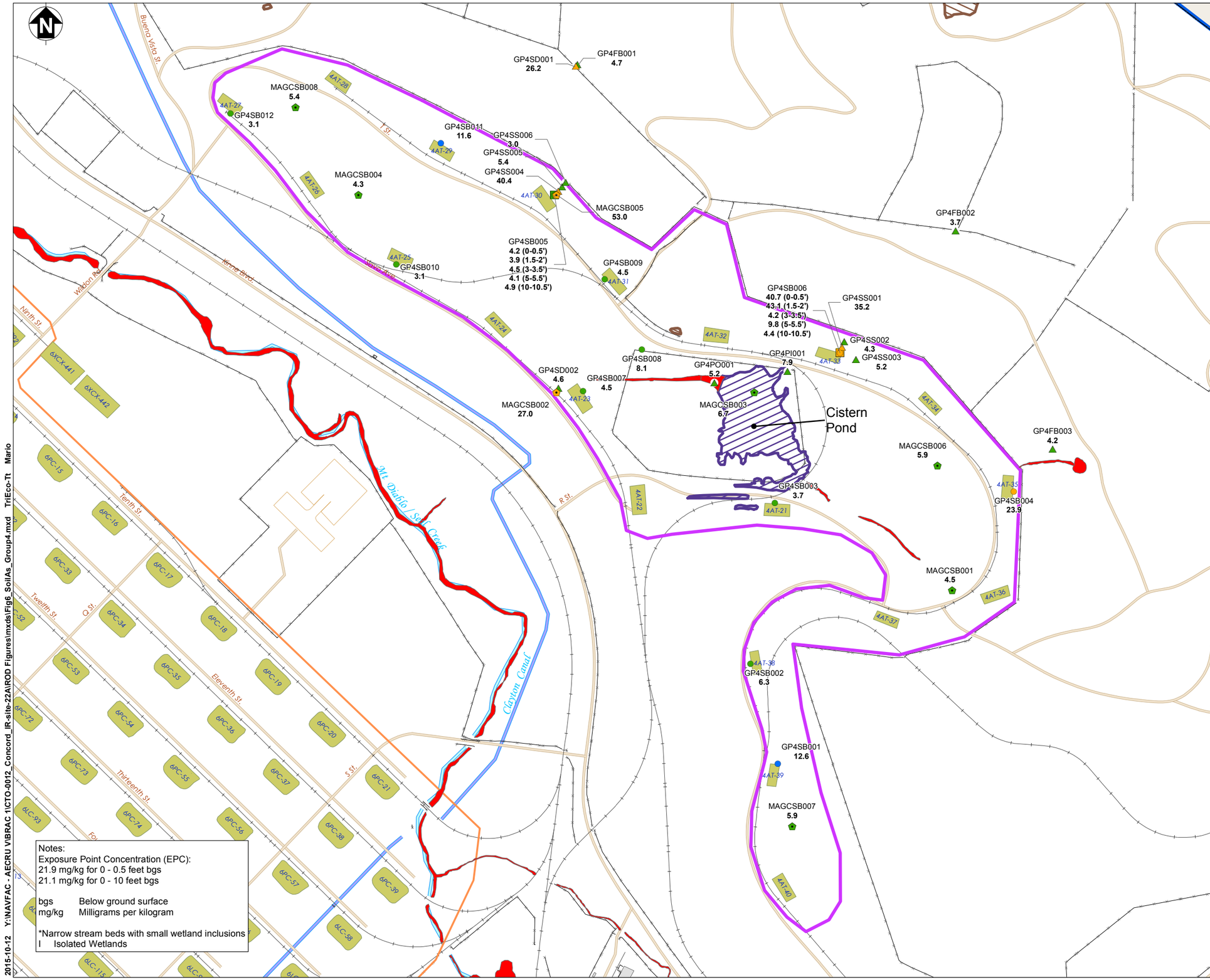
TriEco A Joint Venture

FORMER NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

FIGURE 5
CONCENTRATIONS OF ARSENIC IN SOIL, GROUP 3 MAGAZINE AREA

Record of Decision for IR Site 22A

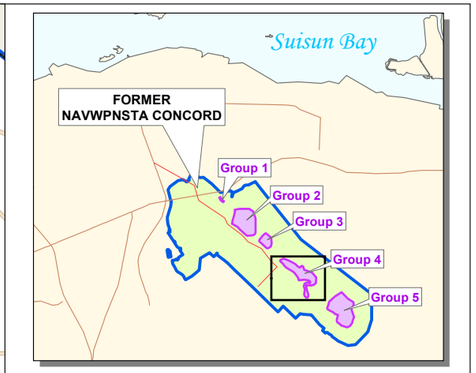
2015-10-12 Y:\NAVFAC - AECRU VIBRAC 1\CTO-0012_Concord_IR-site-22A\ROD Figures\mxds\Fig5_SoilAs_Group3.mxd TriEco-Tt Mario



Notes:
Exposure Point Concentration (EPC):
21.9 mg/kg for 0 - 0.5 feet bgs
21.1 mg/kg for 0 - 10 feet bgs

bgs Below ground surface
mg/kg Milligrams per kilogram

*Narrow stream beds with small wetland inclusions
I Isolated Wetlands



- 2005 Sampling Location (0-0.5 ft bgs)
- 2007 Tier I Sampling Location (0-0.5 ft bgs)
- 2008 Tier II Sampling Location (0-0.5 ft bgs)
- 2008 Tier II Soil Boring Location
- Ammunition Magazine
- Group 4 Magazine Area Boundary
- Site 22 Boundary
- Former NAVWPNSTA Concord Boundary
- Jurisdictional Waters w/Wetlands*
- Jurisdictional Wetlands
- Non-Jurisdictional Waters (I)
- Building
- Street
- Railroad
- Fence Line

GP3SB004 — Sampling Station ID
4.8 — Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP5SB012 — Sampling Station ID
3.9 (1.5-2') — Arsenic Concentration in mg/kg; Sample Depth in feet bgs

- Result Less than or Equal to 10 mg/kg
- Greater than 10 mg/kg and Less than Equal to 22 mg/kg
- Greater than 22 mg/kg

0 500 1,000
Feet

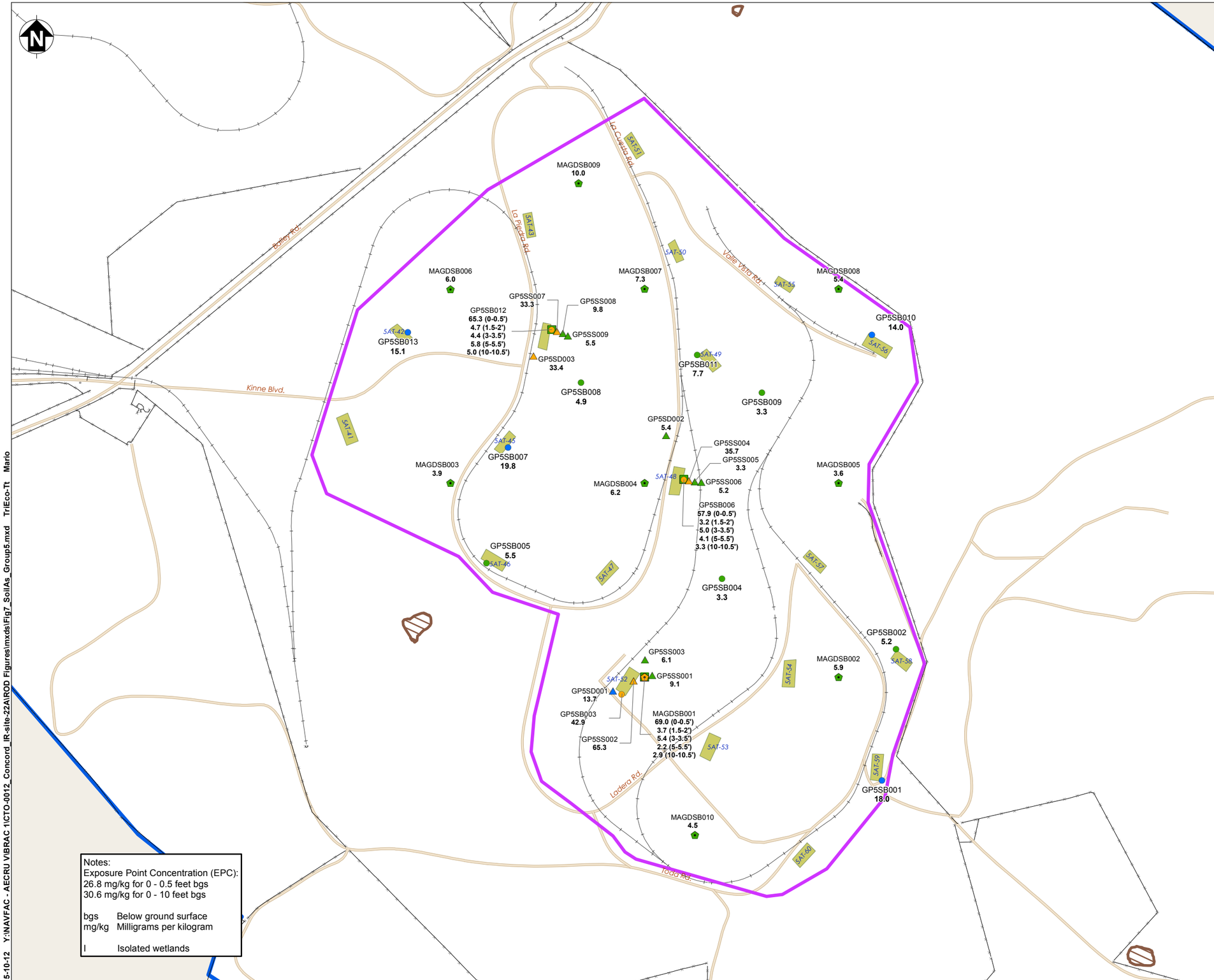
TriEco A Joint Venture

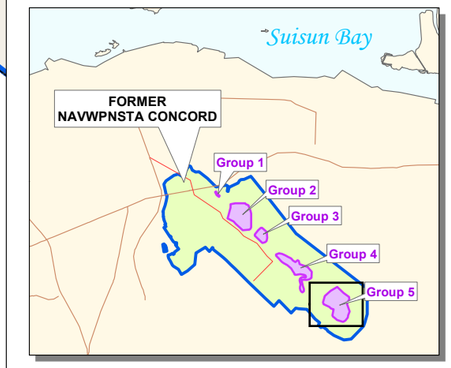
FORMER NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

FIGURE 6
CONCENTRATIONS OF ARSENIC IN SOIL, GROUP 4 MAGAZINE AREA

Record of Decision for IR Site 22A

2015-10-12 Y:\NAVFAC - AECRU VIBRAC 1\CTO-0012_Concord_IR-site-22A\ROD Figures\mxds\Fig6_SoilAs_Group4.mxd TriEco-Tt Mario





2005 Sampling Location (0-0.5 ft bgs)

2007 Tier I Sampling Location (0-0.5 ft bgs)

2008 Tier II Sampling Location (0-0.5 ft bgs)

2008 Tier II Soil Boring Location

Ammunition Magazine

Group 5 Magazine Area Boundary

Former NAVWPNSTA Concord Boundary

Non-Jurisdictional Waters (I)

Building

Street

Railroad

Fence Line

GP3SB004 — Sampling Station ID
4.8 — Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP5SB012 — Sampling Station ID
4.7 (1.5-2') — Arsenic Concentration in mg/kg; Sample Depth in feet bgs

Result Less than or Equal to 10 mg/kg

Greater than 10 mg/kg and Less than or Equal to 22 mg/kg

Greater than 22 mg/kg

0 500 1,000
Feet

TriEco A Joint Venture

Notes:
Exposure Point Concentration (EPC):
26.8 mg/kg for 0 - 0.5 feet bgs
30.6 mg/kg for 0 - 10 feet bgs

bgs Below ground surface
mg/kg Milligrams per kilogram

I Isolated wetlands

FORMER NAVAL WEAPONS STATION
SEAL BEACH DETACHMENT CONCORD

FIGURE 7
CONCENTRATIONS OF ARSENIC IN SOIL, GROUP 5 MAGAZINE AREA

Record of Decision for IR Site 22A

2015-10-12 Y:\NAVFAC - AECRU VIBRAC 1\CTO-0012_Concord_IR-site-22A\ROD Figures\mxds\Fig7_SoilAs_Group5.mxd TriEco-Tt Mario

A complete assessment of contamination and risk at IR Site 22A is provided in the RI report, which includes a **BHHRA(7)** and a **screening-level ecological risk assessment (SLERA)(8)**. A summary of site risks and updates based on the risk assessment methodology is provided in Section 2.5 below. The FS report summarized the results of the RI and provides the basis for remedy evaluation. The total volume of impacted soil is approximately 6,200 cubic yards over a 7-acre area. Table 1 summarizes the previous studies and investigations conducted at IR Site 22A.

2.4 CURRENT AND POTENTIAL FUTURE SITE USES

The Navy currently leases out a portion of the Inland Area, including IR Site 22A, as grazing land for cattle. Cattle graze in the Inland Area year round and rotate among various areas, depending on the availability and condition of vegetation.

The Concord City Council certified the January 2010 final Environmental Impact Report (EIR) and adopted its preferred reuse plan for the former NAVWPNSTA Concord on February 23, 2010[6],which includes residential and commercial developments, community facilities, parks and recreation, and open space.

According to the City of Concord's **Reuse Project Area Plan(9)**, the IR Site 22A property will be reused, after future transfer, for:

- Conservation open space (Magazine Groups 3, 4, and 5 and an approximately 74-acre portion of Magazine Group 2)
- Greenways (nearly 4-acre portion of Magazine Group 2)
- Citywide parks and tournament facilities (approximately 77-acre portion of Magazine Group 2)
- Unspecified commercial use (Magazine Group 1)

Future residential land use is not planned for IR Site 22A.

2.5 SUMMARY OF SITE RISKS

The 2009 RI assessed risks to human health and the environment. "Risk" is the likelihood or probability that a hazardous chemical, when released into the environment, will cause adverse effects on exposed humans or other organisms. Analytical results from soil samples were used in a BHHRA and a SLERA to evaluate the potential risk to human and ecological receptors at IR Site 22A. The results of the BHHRA and SLERA are summarized in Sections 2.5.1 and 2.5.2.

[6] City of Concord. 2010. Final Environmental Impact Report. January. Available on-line at: http://www.concordreuseproject.org.

TABLE 1. PREVIOUS INVESTIGATIONS
Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

Previous Document	Date	Investigation Activities
Site Investigation	2005	Based on RI activities that found elevated arsenic in soil at nearby IR Site 22, the IR Site 22A SI analyzed a total of 30 surface soil samples from Groups 2 through 5 Magazine Areas for arsenic. The results of this investigation indicated that arsenic concentrations in soil within the open areas were below the background concentration (10 mg/kg) and that arsenic concentrations in soil within areas near the magazines were above the background concentration. The SI findings were consistent with the working hypothesis that arsenic-containing herbicides were applied to control the fire hazard from vegetation around these structures. Results were discussed with regulatory agencies and incorporated into the 2007 planning documents for the IR Site 22A RI.
Remedial Investigation	2009	Two soil sampling events were conducted in 2007 and 2008 during the RI. A total of 156 soil samples were collected. Arsenic was detected in all the samples at concentrations above the residential preliminary remediation goal (PRG) of 0.39 mg/kg, with a maximum concentration of 69 mg/kg detected in surface soil in the Group 5 Magazine area. Based on the findings of these sampling events, arsenic concentrations were all below the established background level (10 mg/kg) for the samples collected in Magazine Group 1. Within Magazine Groups 2 through 5, arsenic concentrations in soil were generally below the background concentration at depths greater than 0.5 foot bgs. Arsenic concentrations that exceed the background concentration are contained within the upper 0.5 foot of surface soil and have not leached to subsurface soils or into groundwater. A BHHRA developed from the sampling data indicated that the noncancer hazard was below the threshold hazard index (HI) of 1 for all magazine areas for nonresidential and residential scenarios. Additionally, cancer risks were all below 1×10^{-4} for all magazine areas for both nonresidential and residential scenarios. A SLERA indicated arsenic posed a potential risk to at least one receptor in Groups 2 through 5 Magazine Areas. Arsenic was not found to pose an unacceptable risk to any ecological receptors at IR Site 22A, however, when the conservative assumptions of the SLERA were refined in the RI using the Step 3a risk refinement process in accordance with Navy and EPA guidance.
Post RI Sampling	2009	Additional sampling to assess arsenic concentrations was conducted in surface soil southeast of the Group 3 Magazine Area, where hay has been historically burned. The five additional surface samples collected in this area were all below background concentrations for arsenic in soil, indicating this area was not likely used to burn arsenic-contaminated hay mowed from around the magazines. The results of the post-RI sampling were presented in the FS.
Feasibility Study	2011	Based on the results of the soil sampling and BHHRA conducted for elevated arsenic in surface soils, an FS was conducted that evaluated a total of four remedial alternatives. All were found to meet the threshold criteria of protection of human health and the environment and compliance with applicable and relevant or appropriate requirements. The evaluation of remedial alternatives was based on long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost. Based on the comparative analysis, it was determined that a combination of no action and LUCs was effective and implementable.
Proposed Plan	2012	The Proposed Plan invited the public to review and comment on the preferred alternatives (no action and LUCs) for addressing arsenic contamination in soil at IR Site 22A before the final remedy is selected. A public meeting held in December 2012 provided an additional opportunity for the public to learn about the Proposed Plan and provide comments.

TABLE 1. PREVIOUS INVESTIGATIONS (CONTINUED)

Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

References:

ChaduxTt. 2011. "Final Feasibility Study for Installation Restoration Site 22A, Naval Weapons Station Seal Beach Detachment Concord, Concord, California." March 9.

Department of the Navy. 2012. "Proposed Plan for Inland Area, Naval Weapons Station Seal Beach Detachment Concord, Installation Restoration Site 22A, Concord, California." November.

Tetra Tech EM Inc. (Tetra Tech). 2007. "Draft Final Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) for Additional Investigation at Site 22A, Groups 1 through 5 Magazine Areas, Naval Weapons Station Seal Beach Detachment Concord, Concord, California." February 2.

Tetra Tech. 2009. "Final Remedial Investigation Report for Installation Restoration Site 22A, Naval Weapons Station Seal Beach Detachment Concord, Concord, California." June 1.

* The documents listed are available in the Administrative Record (see Appendix D) and provide detailed information used to support remedy selection at IR Site 22A.

Arsenic is the only COC at IR Site 22A, and elevated concentrations occur mainly in surface soil around the magazines. Arsenic appears to have limited mobility at the site and appears to be concentrated and remain in the upper clayey soil layers because it sorbs to soil particles. Although potential **fate and transport(10)** mechanisms for arsenic have been identified, only limited evidence of contaminants migrating off site, or into deeper soil from surface soils, or into groundwater, has been observed at IR Site 22A.

2.5.1 Baseline Human Health Risk Assessment

A BHHRA was completed for IR Site 22A to assess cancer risks and adverse noncancer health effects associated with potential human exposures to chemicals in soil under current and potential future land uses. The BHHRA consisted of four overall steps: (1) data evaluation and selection of **chemicals of potential concern (COPC)(11)**, (2) **exposure assessment(12)**, (3) **toxicity assessment(13)**, and (4) **risk characterization(14)**.

Data from the SI and the RI were compiled to assess conditions in soil at IR Site 22A. These data were used to evaluate potential risks in the BHHRA for Magazine Groups 2 through 5 at IR Site 22A. The BHHRA did not include Group 1, since results for arsenic in soil at this area did not exceed background concentrations. Nonresidential users (current ranchers, future commercial/industrial workers, and future construction workers) and future residents were identified as potential human receptors to COPCs in surface soil (0 to 0.5 foot bgs).

As discussed in Section 2.4, the City of Concord's Reuse Project Area Plan for IR Site 22A proposes the site be developed primarily as conservation open space, greenways, citywide parks and tournament facilities, and unspecified commercial use. Although future residential land use is not planned for any of the magazine groups, the BHHRA evaluated potential risks to future residents, future commercial/industrial workers, and future construction workers from exposure to COPCs in surface soil (0 to 0.5 foot bgs). The residential land use scenario generally represents the greatest potential exposure to site chemicals and is also considered an unrestricted use scenario. Evaluation of the commercial/industrial scenario was based on conservative assumptions generally considered health-protective for other nonresidential scenarios such as park (excluding playgrounds) and recreational purposes. Reuse as a playground falls under the residential use scenario. The construction worker scenario is considered protective of utility and landscape workers.

Arsenic was detected in soil samples, and all receptor reuse scenarios were evaluated for exposure to arsenic in soil from the following **exposure pathways(15)**: incidental ingestion, dermal contact, and inhalation of wind-blown particulates.

The BHHRA included identification of toxicity values (slope factors and reference doses) for COPCs, which were used to characterize potential cancer risks and adverse noncancer health effects. Consistent with Navy guidance,[7] risks were estimated using both federal EPA- and State of California (DTSC)-based toxicity values to account for differences between each

[7] Navy. 2003. Use of California Toxicity Values in CERCLA Human Health Risk Assessments. Environmental Work Instruction 3EN.10. September.

agency's toxicity values. Total, background, and incremental risks were calculated for each magazine area.

Risks to human health are estimated as cancer risks (from exposure to carcinogens) or noncancer hazards (from exposure to noncarcinogens). Cancer risk is generally expressed as a probability. For example, a cancer risk probability of 5 in 100,000 (5×10^{-5}) indicates that out of 100,000 people, five cancer cases may occur as a result of exposure to site-related chemicals. The Navy uses the EPA established risk management range (RMR) of 10^{-4} to 10^{-6} to evaluate site cancer risks. The low end of the range (10^{-6}) is used as the point of departure for identifying when no action is needed. When the cancer risk is above this range (above 10^{-4}), action is generally warranted; when risk is within the range, site-specific factors are considered in determining whether action is required. An HI of 1 or less is considered protective of noncancer hazards. The incremental cancer risks and noncancer HIs for IR Site 22A are summarized in Table 2 and are discussed in the following sections. The **total risks(16)** for Magazine Groups 2 through 5 and **background risks(17)** were estimated in the BHRRA. However, the summary of results presented below is limited to the **incremental risk evaluation(18)** for arsenic; that is, the risks for arsenic that are attributable to site-related activities. No incremental cancer risks or noncancer HIs were calculated for the Group 1 Magazine Area during the BHHRA because site concentrations of arsenic did not exceed background concentrations.

2.5.1.1 Results of BHHRA for Current Land Use

Under the current land use scenario, estimated cancer risks for current ranchers were below or within the EPA RMR (10^{-6} to 10^{-4}) for the EPA- and DTSC-based assessments. Arsenic contributed more than 99 percent of the cancer risk for this receptor. The HI for current ranchers was below the threshold of 1 for noncancer effects for all four magazine areas.

2.5.1.2 Results of BHHRA for Future Land Use Scenarios

Under future land use scenarios, the construction/industrial worker and the resident cancer risks from exposure to arsenic-contaminated surface and subsurface soils were within the EPA RMR for the EPA-based assessment for all four exposure areas. Using State of California toxicity criteria, residential cancer risks for arsenic are above the RMR for Magazine Groups 3, 4, and 5, and are within the RMR for Magazine Group 2. Use of State of California toxicity criteria for the nonresidential receptors results in cancer risks below or within the RMR for all magazine groups. The noncancer HI did not exceed 1 for any of the above scenarios at any of the four exposure areas, and noncancer COCs were not identified.

2.5.1.3 Summary of BHHRA Results and Recommendations

Based on the BHHRA conducted as part of the RI, surface soil (0 to 0.5 foot bgs) was identified as the medium of concern at IR Site 22A, and arsenic was identified as a COC to potential future residents. The cancer risks from exposure to arsenic do not exceed the EPA RMR using EPA-based toxicity values and are equivalent to or less than the risk from background for the depth interval between 0.5 and 10 feet bgs.

TABLE 2. INCREMENTAL CANCER RISK AND NONCANCER HAZARD INDEX VALUES FOR GROUPS 2 THROUGH 5 MAGAZINE AREAS

Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

Receptor	Exposure Area	Soil Depth Interval (feet bgs)[a]	Cancer Risk		Noncancer HI[b]
			Federal	State	
Current Land Use Scenarios					
Rancher	Group 2 Magazine Area	0-0.5	7×10^{-7}	4×10^{-6}	0.004
	Group 3 Magazine Area	0-0.5	1×10^{-6}	8×10^{-6}	0.008
	Group 4 Magazine Area	0-0.5	9×10^{-7}	6×10^{-6}	0.006
	Group 5 Magazine Area	0-0.5	2×10^{-6}	1×10^{-5}	0.01
Future Land Use Scenarios					
Future Industrial Worker	Group 2 Magazine Area	0-0.5	6×10^{-7}	4×10^{-5}	0.04
	Group 3 Magazine Area	0-0.5	1×10^{-5}	7×10^{-5}	0.07
		0-10	1×10^{-5}	9×10^{-5}	0.09
	Group 4 Magazine Area	0-0.5	8×10^{-6}	5×10^{-5}	0.05
		0-10	8×10^{-6}	5×10^{-5}	0.05
	Group 5 Magazine Area	0-0.5	2×10^{-5}	1×10^{-4}	0.1
		0-10	1×10^{-5}	8×10^{-5}	0.07
Future Construction Worker	Group 2 Magazine Area	0-0.5	4×10^{-7}	2×10^{-6}	0.1
	Group 3 Magazine Area	0-0.5	8×10^{-7}	4×10^{-6}	0.2
		0-10	1×10^{-6}	5×10^{-6}	0.3
	Group 4 Magazine Area	0-0.5	6×10^{-7}	3×10^{-6}	0.2
		0-10	6×10^{-7}	3×10^{-6}	0.2
	Group 5 Magazine Area	0-0.5	1×10^{-6}	5×10^{-6}	0.3
		0-10	9×10^{-7}	4×10^{-6}	0.2
Future Resident	Group 2 Magazine Area	0-0.5	2×10^{-5}	1×10^{-4}	0.4
	Group 3 Magazine Area	0-0.5	4×10^{-5}	3×10^{-4}	0.8
		0-10	5×10^{-5}	3×10^{-4}	1
	Group 4 Magazine Area	0-0.5	3×10^{-5}	2×10^{-4}	0.6
		0-10	3×10^{-5}	2×10^{-4}	0.5
	Group 5 Magazine Area	0-0.5	6×10^{-5}	4×10^{-4}	1
		0-10	4×10^{-5}	3×10^{-4}	0.8

Notes:

a Surface soil was evaluated as soil from 0 to 0.5 foot bgs, and subsurface soil was evaluated as soil from 0 to 10 feet bgs. Concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) in Group 2 Magazine Area do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval.

b Noncancer HIs are the same between the state- and federal-based assessments.

As shown in Table 2 (Incremental Cancer Risk and Noncancer and Hazard Index Calculations for Groups 2 through 5 Magazine Areas), the results of the incremental risk evaluation for arsenic show the following:

- For nonresidential scenarios (current rancher, future industrial worker, and future construction worker), cancer risks are either below the point of departure of 1×10^{-6} or were within the risk management range of 1×10^{-6} to 1×10^{-4} for all magazine areas.
- For the residential scenario, cancer risks are within the risk management range for all magazine areas when risks are calculated using federal toxicity criteria for arsenic. Using State of California toxicity criteria, cancer risks for arsenic slightly exceed the upper end of the risk management range of 1×10^{-4} for the Group 3, Group 4, and Group 5 Magazine Areas (ranging from 1×10^{-4} to 4×10^{-4}), and are within the risk management range for Group 2.
- For nonresidential and residential scenarios, the noncancer hazard indices are below the threshold HI of 1 for all magazine areas.

No site-related risk to human health was identified for Group 1 because site concentrations did not exceed background concentrations for this area.

The risks for the background concentration of arsenic in soil (10 mg/kg) were estimated for comparison to the risks calculated for the magazine areas and are shown below in Table 3.

TABLE 3. BACKGROUND CANCER RISK AND NONCANCER HAZARD INDEX VALUES
Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

Receptor	Cancer Risk		Noncancer HI[a]
	Federal	State	
Rancher	8×10^{-7}	5×10^{-6}	0.005
Future Industrial Worker	7×10^{-6}	5×10^{-5}	0.04
Future Construction Worker	4×10^{-7}	2×10^{-6}	0.06
Future Resident [b, c]	3×10^{-5}	2×10^{-4}	0.5

Notes:

a Noncancer HIs are the same between the state- and federal-based assessments.

b The resident cancer risk is based on the cumulative residential exposure as a child (6 years) and as a resident adult (24 years).

c The resident HI is based on exposure to the resident child (6 years).

The background cancer risks are also within the risk management range for the rancher, industrial worker, and commercial worker scenarios, and slightly above the risk management range for a future resident based on State of California toxicity criteria.

- The background arsenic cancer risks for a future industrial worker and construction worker are within the risk management range using both the federal and State of California toxicity criteria.

- The background arsenic cancer risks for a future resident are within the risk management range using the federal toxicity criteria.
- The background arsenic cancer risk for a future resident is slightly above the risk management range using the State of California toxicity criteria.

Based on the findings of the RI, the Navy recommended conducting an FS to evaluate remedial alternatives to address potential human health risks associated with arsenic-contaminated surface soil at IR Site 22A Groups 2 through 5 Magazine Areas, and no further action for Group 1 Magazine Area because concentrations of arsenic were below the background level.

2.5.2 Screening-Level Ecological Risk Assessment and Step 3a Risk Refinement

A SLERA and Step 3a risk refinement were conducted to assess the potential risks to ecological receptors (plants, invertebrates, amphibians, birds, and mammals) associated with exposure to chemicals of potential ecological concern (COPEC) — in this case, arsenic in herbicides in surface soils at IR Site 22A. Potential ecological risks from arsenic concentrations in each of the five groups of magazine areas were evaluated separately. Representative bird and mammal species used to assess risk at IR Site 22A included the American robin, red-tailed hawk, California ground squirrel, western harvest mouse, black-tailed deer, and grey fox. A qualitative evaluation of risk to amphibians was also conducted.

The SLERA consisted of Steps 1 and 2 of the Navy's ecological risk assessment process, also known as the Tier 1 approach. The two steps of a Tier 1 SLERA use existing data and conservative assumptions regarding contaminant exposure. In Step 1 (problem formulation), the environmental setting, chemical fate and transport, ecotoxicity and potential receptors, and complete exposure pathways were considered to develop assessment and measurement endpoints and an **ecological conceptual site model**(19). Potentially complete exposure pathways were identified for both lower trophic level (plants and terrestrial invertebrates) and upper trophic level (birds and mammals) terrestrial receptors based on chemicals in soil. In Step 2, concentrations of chemicals in soil were compared with ecotoxicity benchmarks to assess risk to plants and invertebrates, and food chain models were used to estimate daily doses that were compared with toxicity reference values (TRV) to assess risk to birds and mammals. Each TRV represents a critical exposure level from a toxicological study and is supported by a data set of toxicological exposures and effects. A low TRV is a conservative value consistent with a chronic no observed adverse effect level. A high TRV represents either a mid-range or lowest observed adverse effect level for a COPEC, where the endpoint of toxicity was ecologically relevant. TRVs were derived separately for birds and mammals. The ratio of the estimated daily doses to the TRV results in a hazard quotient (HQ). By calculating both an $HQ_{(dose/high\ TRV)}$ and $HQ_{(dose/low\ TRV)}$, a risk manager can more definitively assess risk to the typical individual animal in the overall population. Since **uncertainty**(20) plays an important role in risk-based decision-making, it is incorporated explicitly into the risk characterization process.

The SLERA considered only potential risk from exposure to arsenic in soil because soil was regarded as the most important exposure medium at IR Site 22A. Ingestion of contaminated prey and soil was considered the predominant exposure pathway for birds and mammals. Exposure to surface water, windblown dust, and groundwater were not evaluated in the SLERA. A potential

minor exposure pathway via ingestion of water when it is present in the drainage ditches and other depressions and in Cistern Pond (within Magazine Group 4) was acknowledged in the SLERA. However, exposure to surface water was not evaluated because transport of arsenic to those surface water bodies was considered a minor transport route. Contaminant distribution in soil and sediment along this route shows no evidence of substantial migration of arsenic, as concentrations are not above background outside of the areas around each magazine where herbicides were applied to reduce fire hazards. Furthermore, windblown dust could represent a complete exposure pathway because some areas of exposed soil exist, but it was not evaluated because it is an insignificant pathway when compared with food-chain transfer and direct exposure to soils. Finally, exposure to groundwater was not considered because groundwater is too deep to be accessible to ecological receptors.

Risk to amphibians was evaluated qualitatively because very little toxicity information is available to assess potential risk to amphibians from exposure to arsenic in soil. The SLERA acknowledged that there could be some exposure to amphibians if arsenic were dissolved in surface water; however, the soil data suggest there has been little migration of arsenic outside of the area where arsenical herbicide was applied around each magazine. This pathway was considered minor and therefore was not directly evaluated in the RI, and no surface water samples were collected from Cistern Pond (within Magazine Group 4).

The **Step 3a risk refinement**(21) (the initial step of the Tier 2 process) refines the SLERA when unacceptable or uncertain risks are identified at the end of Step 2. This risk refinement considers less conservative and more realistic site-specific exposure assumptions in the risk calculations.

The results of the SLERA indicated arsenic posed a potential risk to plants in Groups 2 through 5 Magazine Areas, and to invertebrates in Groups 3 through 5 Magazine Areas. Arsenic also posed a potential risk to small omnivorous mammals and small herbivorous mammals, as represented by the surrogate species (western harvest mouse and California ground squirrel), at Groups 2 through 5 Magazine Areas. When the conservative assumptions of the SLERA were refined in the RI using the Step 3a risk refinement process in accordance with Navy and EPA guidance; however, arsenic was not found to pose an unacceptable risk to any ecological receptors at IR Site 22A.

In August 2014, during the development of the ROD, the Water Board expressed concern that the SLERA did not directly evaluate risk to amphibians from exposure to arsenic in surface water and that no water samples were collected from Cistern Pond. The Water Board's position is that there is some uncertainty in the conclusion that arsenic does not pose an unacceptable risk to any ecological receptors at IR Site 22A because the potential risk to amphibians from arsenic in surface water was not directly evaluated. The Water Board noted that collection and analysis of water samples from Cistern Pond would provide the best indication of actual exposure to amphibians. The Water Board further noted that the soil concentrations may not reflect the level of exposure to arsenic in Cistern Pond because the solubility of arsenic is variable depending on several factors, including speciation, pH, and redox potential.

The Navy's position is that collection of water samples from Cistern Pond was not necessary because there is no indication of a release to Cistern Pond or a transport pathway to it. Use of available soil data is appropriate in a SLERA and is sufficient to ascertain there is no unacceptable risk to ecological receptors at IR Site 22A. Arsenic concentrations in soil samples collected during the RI at the inlet and outlet to Cistern Pond, within the area of the pond itself, and in drainages east of the pond were below background concentrations, indicating that the area around and transport pathways into and out of the pond were not affected by arsenic. Arsenic concentrations above background remain limited to the surface soil around magazines where originally applied.

2.5.3 Basis for Response Action

The response action selected in this ROD is necessary to protect the public health or welfare and the environment from actual or potential releases of hazardous substances into the environment. The response action specifically addresses human health risk from elevated levels of arsenic in soil. The Navy, in partnership with EPA, DTSC, and the Water Board, considered all pertinent factors in accordance with CERCLA and the NCP remedy selection criteria. All parties concluded that a combination of no action and LUCs at IR Site 22A would limit public exposure to arsenic-contaminated surface soil. The basis for the response action includes the following factor:

- Concentrations of arsenic in surface soil in Magazine Groups 3 and 5 could pose risk to hypothetical future residents via inhalation, ingestion, and dermal contact.

2.6 PRINCIPAL THREAT WASTE

No wastes at IR Site 22A constitute a "principal threat." Principal threat wastes are hazardous or highly toxic source materials that result in ongoing contamination to surrounding media, generally cannot be reliably contained, or that present a significant risk to human health or the environment should exposure occur. Although elevated concentrations of arsenic are present in surface soil, the potential risks do not indicate there is a principal threat waste because arsenic in soil at IR Site 22A is relatively immobile and is not highly toxic at the concentrations found at the site.

2.7 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAO) are established based on attainment of regulatory requirements, standards, and guidance; contaminated media; COCs; potential receptors and exposure scenarios; and human health and ecological risks. Ultimately, the success of a remedial action is measured by its ability to meet the RAOs. The following RAO was developed during the FS for IR Site 22A:

- Reduce exposure of potential future residents through inhalation, ingestion, and dermal contact to arsenic concentrations in surface soils at IR Site 22A that result in a cancer risk above 1×10^{-4} and a hazard index greater than 1.

The remedial goal identified in the Proposed Plan for arsenic in soil at IR Site 22A is 22 mg/kg. The remedial goal for arsenic is a human health risk-based concentration protective of residential receptors. The remedial goal was calculated based on a target hazard index of 1 using exposure factors corresponding to those in the BHHRA.

The remedial goal of 22 mg/kg results in a cancer risk of 6 x 10^{-5} using federal toxicity criteria and 4 x 10^{-4} using State of California toxicity criteria under the future resident exposure scenario; however, much of this cancer risk is attributable to background levels. The cancer risks associated with the arsenic background threshold value of 10 mg/kg equate to a risk of 3 x10^{-5} based on federal toxicity criteria and 2 x 10^{-4} based on State of California toxicity criteria for the hypothetical future resident. The cancer risks attributable to background (Table 3), the incremental cancer risk estimated for each magazine group (Table 2), and the fact that arsenic in soil will not be 100 percent bioavailable, were all considered in selecting the remedial goal of 22 mg/kg.

Exposure point concentrations (EPC) — which are the statistically calculated concentration of arsenic in soil that represent the concentration of arsenic throughout an area for risk assessments — for the Magazine Groups 1 through 5 are shown below in Table 4. As shown in this table, the EPCs for Groups 3 and 5 Magazine Areas are greater than the remedial goal of 22 mg/kg.

TABLE 4. EXPOSURE POINT CONCENTRATION SUMMARY
Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

Magazine Area	0 - 0.5 foot bgs EPC (mg/kg)	0 - 10 feet bgs EPC (mg/kg)
Group 1	4.82	4.82
Group 2	18.3	16.7
Group 3	26.8	30.6
Group 4	21.9	21.2
Group 5	32.1	26.9

2.8 DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

Preliminary screening of **general response actions (GRA)**(22) and process options was completed in the FS report to refine the remedy selection process to address contamination in soil. GRAs were identified to achieve RAOs: no action; LUCs, which include institutional controls (IC) and engineering controls (EC); and active remediation. Remedial technologies and response actions were evaluated with respect to implementability, effectiveness, and relative cost (high, moderate, and low) in a preliminary screening. A detailed cost analysis was performed as part of this preliminary screening. The six basic remedial technologies and process options developed for human health are no action; access restrictions; land use restrictions; covenants to restrict use of property; excavation and disposal at an off-site treatment/disposal facility; and excavation and on-site containment. Remedial alternatives were developed from these technologies and process options to protect human health and ecological health based on the

technologies and process options retained for a detailed comparative analysis in accordance with the NCP.

2.8.1 Description of Remedial Alternatives

Table 5 provides the major components, details, and cost of each remedial alternative identified for arsenic in soil. Since the arsenic concentrations and associated risks differ among the magazine areas, the preferred alternative for each magazine area was selected independently based on the remedial alternatives listed below and described in Table 5.

- Alternative 1: No Action
- Alternative 2: LUCs
- Alternative 3: Excavation and Off-Site Disposal
- Alternative 4: Excavation, Containment, and LUCs

2.8.2 Comparative Analysis of Alternatives

A comparative analysis of alternatives with respect to the nine evaluation criteria was completed as presented in Table 6 and described below. The no-action alternative (Alternative 1) was included in the FS for comparison purposes per the NCP.

TABLE 5. REMEDIAL ALTERNATIVES

Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

Remedial Alternative	Components	Details	Cost
1: No Action *No action for contaminated soil and no restriction of site use*	▪ None; existing conditions would remain	▪ No action. ▪ Evaluation of no action alternative is required by the NCP.	No cost
2: LUCs *LUCs to limit residential exposure to arsenic-containing surface soil*	▪ LUCs ▪ Long-term operation and maintenance (O&M)	▪ Land use controls will be applied to prohibit residential use (including residential use, hospitals (other than veterinary hospitals), schools for persons under 21 years of age, day care centers for children, and playgrounds) of the property. ▪ Notices and covenants restricting residential use of the site to limit residential exposure to arsenic in surface soil will apply to future landowners and occupants, or property developers. ▪ A LUC RD will be prepared describing the specific LUC implementation actions. ▪ Long-term O&M will include 5-year reviews to evaluate the protectiveness of the alternative. ▪ The estimated time to implement LUCs is 12 months.	Capital Cost: $191,000 Total O&M Cost: $0 **Present-Value Cost: $659,000(23)** Discount Rate: 2.8%[a] Timeframe: 30 years
3: Excavation and Off-Site Disposal *Excavation of surface soil containing arsenic above remedial goal and off-site disposal*	▪ Excavation ▪ Off-site disposal	▪ Surface soil (0 to 0.5 foot bgs) that contains arsenic at concentrations above the remedial goal (22 mg/kg) will be excavated and the excavations will be backfilled with clean soil. Approximately 6,200 cubic yards of soil will be excavated over a 7-acre area. ▪ After soil is excavated, soil samples will be collected around the lateral and vertical extent of the excavation on the excavation floor and analyzed for arsenic to confirm concentrations are below the remedial goal. ▪ Contaminated soil will be transported off site to a licensed disposal facility. ▪ The estimated time to complete remediation is 16 months.	Capital Cost: $256,000 Total O&M Cost: $0 **Present-Value Cost: $1.73 million(24)** Discount Rate: 2.1%[a] Timeframe: 1.0 years
4: Excavation, Containment, and LUCs *Excavation of surface soil containing arsenic above remedial goal and containing it on-site in a corrective action management unit (CAMU)*	▪ Excavation ▪ CAMU ▪ LUCs ▪ Long-term O&M	▪ Surface soil (0 to 0.5 foot bgs) that contains arsenic at concentrations above the remedial goal (22 mg/kg) will be excavated and the excavations will be backfilled with clean soil. Approximately 6,200 cubic yards of soil will be excavated over a 7-acre area. ▪ After soil is excavated, soil samples will be collected around the lateral and vertical extent of the excavation on the excavation floor and analyzed for arsenic to confirm concentrations are below the remedial goal. ▪ The excavated soil will be contained in a CAMU. ▪ LUCs will be implemented for the CAMU to maintain the effectiveness of the alternative. ▪ The estimated time to complete remediation is 17 months. ▪ The CAMU will require long-term O&M and monitoring.	Capital Cost: $425,000[b] Total O&M Cost: $26,000 **Present-Value Cost: $2.36 million(25)** Discount Rate: 2.8%[a] Timeframe: 30 years

Notes:

a Different discount rates were used to match the timeframe to achieve the remedial goals.

b Capital cost for Alternative 4 is greater than Alternative 3 because construction, operation, and maintenance of a CAMU is more costly than off-site disposal for this volume of soil.

TABLE 6. REMEDIAL ALTERNATIVES RANKING
Record of Decision for IR Site 22A, Former NAVWPNSTA Concord, Concord, California

Alternatives	Overall Protection of Human Health and the Environment [a]	Compliance with ARARs [a]	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($ Million)	Overall Rating by Alternative
Alternative 1: No Action	Protective	NA	◐	○	●	●	● ($0)	◐
Alternative 2: Land Use Controls	Protective	Meets ARARs	◐	○	●	●	◐ ($0.66)	◐
Alternative 3: Excavation and Off-Site Disposal	Protective	Meets ARARs	●	○	◐	◐	◐ ($1.73)	◐
Alternative 4: Excavation, Containment, and Land Use Controls	Protective	Meets ARARs	◐	○	◐	◐	◐ ($2.36)	◐

Legend:
- ○ Poor
- ◐ Marginal
- ◐ Good
- ◐ Very Good
- ● Excellent

Notes:

a Overall protection of human health and the environment and compliance with ARARs are threshold criteria and alternatives are judged as either meeting or not meeting the criteria.

ARARs Applicable or relevant and appropriate requirements

NA Not applicable

Threshold Criteria

1. Overall Protection of Human Health and the Environment

Alternative 1 (No Action) is rated as protective because arsenic in surface soil at the Magazine Groups 1, 2, and 4 does not pose an unacceptable risk to human health or the environment. Alternative 1 was also rated as protective for Magazine Groups 3 and 5 based on risks calculated using federal toxicity criteria, as noted in the FS. Therefore, Alternative 1 meets this threshold criterion, as shown in Table 6. Alternatives 2 (LUCs), 3 (Excavation and Off-site Disposal), and 4 (Excavation, Containment, and LUCs) each meet the first threshold criterion of overall protection of human health and the environment for all Magazine Groups.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)

CERCLA § 121(d)(1) states that remedial actions at 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 that are determined to be legally applicable or relevant and appropriate. Chemical-specific ARARs are health- or risk-based numerical values or methods that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions on the concentrations of hazardous substances or on conducting activities solely because they are in specific locations. Specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site.

Alternative 1 would not comply with ARARs. Alternatives 2, 3, and 4 meet the threshold criterion of compliance with the ARARs identified in Appendix A of this report.

Primary Balancing Criteria

3. Long-Term Effectiveness and Permanence

Alternative 3 is the most effective and permanent alternative in the long term because surface soil at the site with concentrations above the arsenic remedial goal would be excavated and removed. Alternatives 2 and 4 would not be as effective as Alternative 3 because they would rely on LUCs to restrict residential use. The LUCs for Alternative 2 would restrict future residential use within areas that exceed the remedial goal, whereas the LUCs for Alternative 4 would prohibit use only of the smaller CAMU area. However, the CAMU in Alternative 4 must be monitored and maintained to sustain the protectiveness of the remedial alternative. Alternative 3 is the most effective and permanent alternative in the long term, followed in order by Alternatives 4, 2, and 1.

4. Reduction in Toxicity, Mobility, or Volume through Treatment

None of the alternatives includes treatment of arsenic in surface soil to reduce the toxicity, mobility, or volume of contaminated soil. As a result, none of the remedial alternatives satisfies the statutory preference for treatment.

5. Short-Term Effectiveness

Alternative 1 would not create any new risks to the community or the environment because no action would be taken; this alternative is thus highly effective in the short term. Alternative 2 would also be highly effective in the short term by restricting use of the land and thereby removing the exposure pathway. Alternatives 3 and 4 include excavation of soil, which may expose the community, remedial workers, or the environment to contaminated soils. Alternative 4 is more effective in the short term than Alternative 3 because the public would not be potentially exposed to contaminated soils during transportation of the soil from IR Site 22A to a landfill. Alternatives 1 and 2 are the most effective in the short term, followed in order by Alternatives 4 and 3.

6. Implementability

Alternative 1 would be easy to implement because it requires no action. Alternative 2 would also be very easy to implement because it consists of legal and administrative actions only. Procedures for implementing LUCs are already in place, and delays or difficulties in coordinating with other regulatory agencies are not likely. Alternatives 3 and 4 include activities that are relatively common (such as excavation, transportation, off-site disposal, and containment of soil), and vendors and equipment to perform these activities are readily available. Protection measures would be required for federally- or state-listed threatened amphibian species, if present, increasing the difficulty of implementation. Alternatives 1 and 2 are the easiest to implement, followed by Alternatives 3 and 4.

7. Cost(26)

No costs would be associated with Alternative 1 because it requires no action. All other alternatives involve significant costs; LUCs (Alternative 2) ($0.66 million), is the least expensive; excavation and off-site disposal (Alternative 3) would cost $1.73 million; and excavation, containment and LUCs (Alternative 4), the most expensive, would cost $2.36 million. These differences are reflected in Table 6. The accuracy of the cost estimate for each alternative is expected to be within plus 50 percent to minus 30 percent of actual costs.

Modifying Criteria

8. State Acceptance

State involvement has been solicited throughout the CERCLA process. The Navy, EPA, DTSC, and the Water Board coordinated on all major documents and investigations associated with IR Site 22A, including the RI, FS, and Proposed Plan. Based on these reviews and discussions of key documents, the state supports the selected remedy. The State of California's acceptance of the Navy's selected remedial alternative is documented in this ROD.

9. Community Acceptance

The Proposed Plan was issued on November 5, 2012, followed by a 45-day comment period. A public notice advertising the Proposed Plan, public comment period, and public meeting to present the Proposed Plan was published in the *Contra Costa Times* on November 18, 2012. The public meeting to present the Proposed Plan was held on December 5, 2012, and attended by five

community members. Community acceptance was evaluated based on comments received during the comment period and the public meeting. A responsiveness summary to comments received on the Proposed Plan is provided in Appendix B. No public comments that would warrant a revision to the preferred alternative were received.

2.9 SELECTED REMEDY

2.9.1 Rationale for Selected Remedy

As indicated in Table 6, the no action alternative (Alternative 1) and implementation of LUCs (Alternative 2) ranked the highest in the comparative analysis of remedial alternatives for protecting human health. The appropriate alternative for each magazine area was selected independently, as noted in Section 2.8.1. The Navy has selected No Action for Magazine Groups 1, 2, and 4, and LUCs for Magazine Groups 3 and 5. The Navy's rationale for the selected remedy for IR Site 22A is summarized below.

No Action for Magazine Groups 1, 2, and 4

The Navy selected no action for Magazine Groups 1, 2, and 4 at IR Site 22A. Arsenic in surface soil in these areas does not pose an unacceptable risk to human health or the environment. Additionally, arsenic in surface soil at IR Site 22A is limited in extent and is relatively immobile. Therefore, no action is necessary to ensure protection of human health and the environment for IR Site 22A Magazine Groups 1, 2, and 4 for the reasons summarized below.

No action for Magazine Groups 1, 2 and 4 is:

- Protective of human health and the environment because (1) arsenic concentrations are below the background concentration level at Magazine Group 1; (2) cancer risks from arsenic at Magazine Groups 2 and 4 are within the federal risk management range, and the HIs do not exceed 1; and (3) exposure to arsenic in soil would not cause adverse effects on plants or animals at IR Site 22A.
- The most effective in the short term and would have the least impact on the community, remedial workers, and the environment because surface soil would not be disturbed.
- Easy to implement because it would not require implementation of LUCs or construction and operation of a remedial system.
- The most cost-effective because no cost is associated with it.

LUCs (Alternative 2) for Magazine Groups 3 and 5

The Navy selected implementation of LUCs (Alternative 2) for Magazine Groups 3 and 5 at IR Site 22A. Implementation of LUCs will prohibit residential reuse, hospitals (other than veterinary hospitals), schools for persons under 21 years of age, day care facilities for children, and playgrounds to prevent contact with the soil to limit human exposure to arsenic-contaminated surface soil at Magazine Groups 3 and 5, where the exposure point

concentration is above the remedial goal. Additionally, monitoring and inspections would be conducted to ensure that the LUCs are being maintained. Implementation of this remedial alternative would not preclude further response actions by future landowners or developers to support a less-restricted use of the site. However, any modification or termination of the LUCs will require the approval of the Navy and the regulatory agencies, and the requirements for the notification processes will be noted in the LUC RD. LUCs are selected for Magazine Groups 3 and 5 for the reasons summarized below.

LUCs for Magazine Groups 3 and 5 are:

- Protective of human health and the environment because (1) LUCs would restrict use of the property and limit exposure to arsenic-contaminated surface soil under a future potential residential scenario, and (2) exposure to arsenic in soil would not cause adverse effects on plants or animals at IR Site 22A.
- Effective in the short term and would have little impact on the community, remedial workers, and the environment because surface soil would not be disturbed.
- Easy to implement because only legal and administrative controls would be necessary.
- The most cost-effective way to reduce exposure to arsenic under a residential scenario.
- Consistent with the City of Concord's Reuse Project Area Plan for Magazine Groups 3 and 5; residential reuse is not planned.

2.9.2 Description of Selected Remedy

No action will be taken at Magazine Groups 1, 2, and 4.

The remedy selected to protect human health at Magazine Groups 3 and 5 at IR Site 22A consists of implementing LUCs. LUCs applied to IR Site 22A will consist of legal and administrative mechanisms that will implement land use and access restrictions to prevent residential exposure to arsenic in surface soil. The LUC objectives will be to protect human health by preventing residential exposure to arsenic in surface soil at Magazine Groups 3 and 5, where the total arsenic exposure point concentrations exceed the remedial goal of 22 mg/kg. Implementation of LUCs will prohibit residential reuse of Magazine Groups 3 and 5. Residential reuses that will be prohibited include residential use, hospitals (other than veterinary hospitals), schools for persons under 21 years of age, day care centers for children, and playgrounds. Commercial and industrial use and open space parkland and other recreational reuse activities would not be prohibited. Additionally, monitoring and inspections would be conducted to ensure that the LUCs are being maintained. LUCs will not preclude further response actions or other soil management activities by future landowners or property developers to support less restricted uses of the property, although any modification or termination of the LUCs will require the approval of the Navy and the regulatory agencies, which will be noted in the LUC RD. The process for modification and termination of the LUCs will be specified in the LUC RD.

LUCs are required on a property where the selected remedy results in contamination remaining above levels that allow for unlimited use and unrestricted exposure. LUCs will remain in place until arsenic concentrations in surface soil have been reduced or remediated to levels that allow for unrestricted site use and exposure. Implementation of LUCs includes requirements for monitoring, inspections, and reporting to ensure compliance with land use or activity restrictions.

The Navy has concluded that it will rely on proprietary controls in the form of environmental restrictive covenants as provided in the "Memorandum of Agreement between the United States Department of the Navy and the California Department of Toxic Substances Control" and attached covenant models (the "Navy/DTSC MOA").

More specifically, land use and activity restrictions will be incorporated into two separate legal instruments as provided in the Navy/DTSC MOA:

1. Restrictive covenants included in federal quitclaim deeds conveying property from the federal government to the property recipient.
2. Restrictive covenants included in one or more "Covenant to Restrict Use of Property" entered into by the Navy and DTSC as provided in the Navy/DTSC MOA and consistent with the substantive provisions of California Code of Regulations (Cal. Code Regs.) Title (tit.) 22 § 67391.1.

The "Covenant(s) to Restrict Use of Property" will incorporate the land use restrictions into environmental restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The Quitclaim Deed(s) will include the identical land use and activity restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the Navy against future transferees.

A LUC RD will be prepared in accordance with the schedule set forth in the FFA. The LUC RD will describe the specific LUC implementation actions, including requirements for 5-year remedy reviews under CERCLA; frequency and requirements for periodic monitoring or visual inspection; notification procedures to the regulatory agencies for planned property conveyance; corrective action requirements or responses to actions inconsistent with the LUCs; a list of LUCs with expected durations; and maps identifying where the LUCs are to be implemented. The LUC RD will identify the roles of local, state, and federal government in administering the LUC RD. Long-term O&M would include 5-year reviews to evaluate the protectiveness of the remedy. The LUC RD will also describe notification requirements and the Navy and regulatory agency approval process should a future land owner or developer conduct a response action to support a less-restricted use of the site.

The Navy is responsible for implementing, monitoring, reporting on, maintaining, and enforcing LUCs. Although the Navy may later transfer the procedural responsibilities for enforcement of land use controls to another party by contract, property transfer agreement, or through other means, the Navy will retain ultimate responsibility for the integrity of the remedy. The Navy will not modify or terminate LUCs, implementation actions, or modify land use without approval by EPA and DTSC. The Navy will seek prior concurrence before

any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.

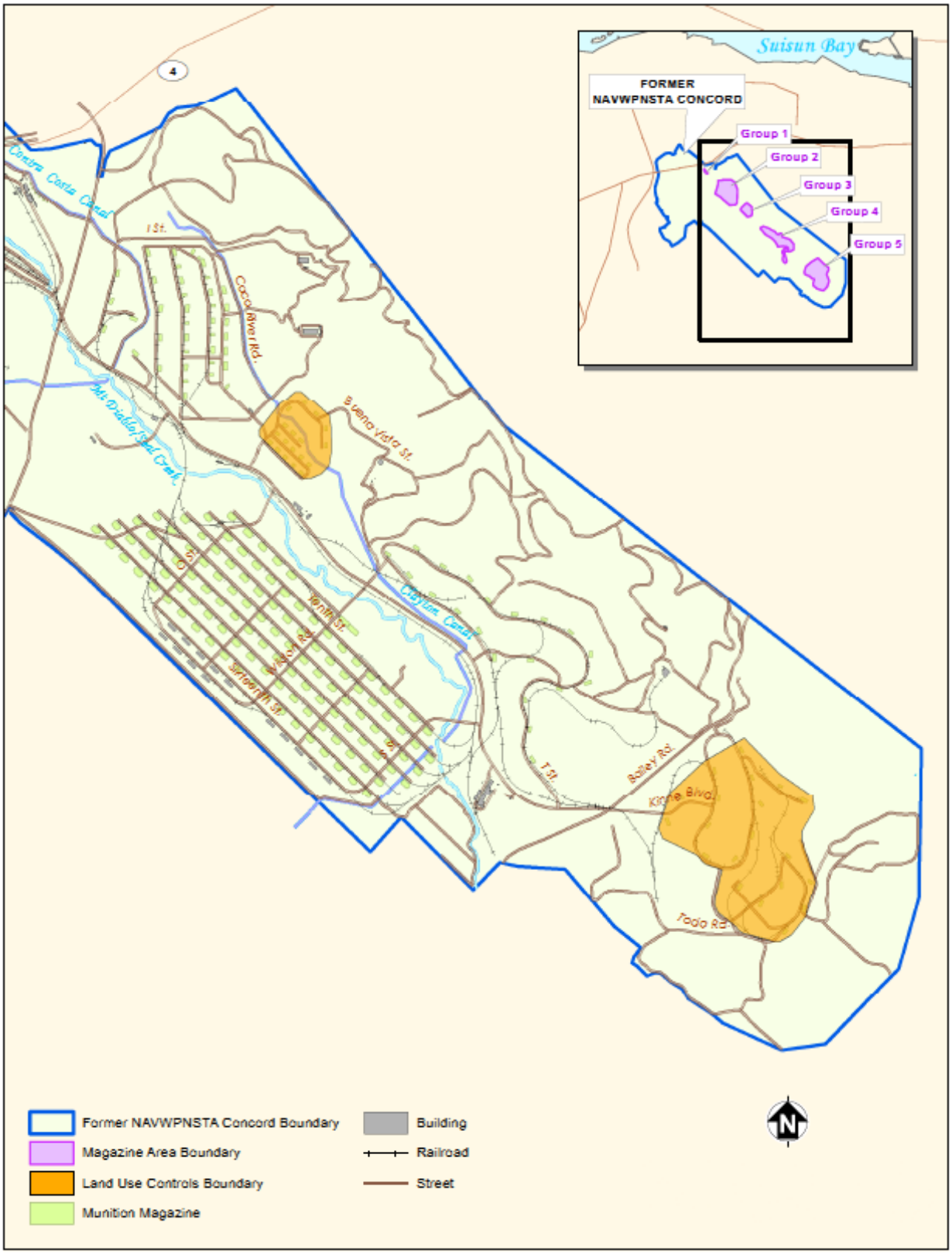
The estimated time required to implement Alternative 2 is 1 year or less to develop the LUC RD, and the effects of implementing this alternative would be nearly immediate. The estimated 30-year total present value cost for Alternative 2 is $659,000, including preparation of the LUC RD and other legal documents to implement the LUCs, and costs for periodic 5-year reviews.

The selected remedy was chosen to meet the RAOs in a timely, efficient, and cost-effective manner. Long-term enforcement of the LUCs will be conducted to maintain the effectiveness of the land use restrictions, access restrictions, and covenants. In accordance with California law, the land use covenant will be recorded, and future owners will be notified through a title search of deed restrictions. Figure 8 shows the areas of IR Site 22A where the remedial action (LUC) for arsenic-contaminated surface soil would occur.

2.9.3 Expected Outcomes of Land Use Controls

The selected remedy for protecting human health is expected to achieve RAOs by implementing LUCs to prevent residential exposure to arsenic-contaminated surface soil, thereby limiting the dermal contact, ingestion, or inhalation exposures to arsenic-contaminated surface soil above the remedial goal (22 mg/kg). After this ROD is executed, the Navy will prepare the LUC RD that will specifically define the LUCs in the form of institutional controls (deed covenants). LUCs would be implemented through access restrictions, land use restrictions, and covenants to prohibit residential reuse of the property. Residential reuses that will be prohibited include residential use, hospitals (other than veterinary hospitals), schools for persons under 21 years of age, day care centers for children, and playgrounds. Implementation of this remedial alternative will not preclude further response actions or other soil management activities by future landowners or property developers to support less restricted uses of the property.

Figure 8. Land Use Controls Boundary



2.9.4 Statutory Determinations

In accordance with the NCP, the selected remedy meets the following statutory determinations.

- **Protection of Human Health and the Environment** – The selected remedy for Magazine Groups 3 and 5, Alternative 2, will protect human health through implementing LUCs, which will prevent residential exposure to arsenic-contaminated surface soils. Arsenic concentrations in surface soil in Magazine Groups 1, 2, and 4 do not pose an unacceptable risk to human health or the environment, so no action is necessary.

- **Compliance with ARARs** – The selected remedy for Magazine Groups 3 and 5, Alternative 2, will meet all chemical-, location-, and action-specific ARARs. The ARARs that will be met by the selected remedy are summarized in Appendix A.

- **Cost-Effectiveness** – The selected remedies for each magazine area are cost effective and will provide overall protectiveness proportional to the cost.

- **Use of Permanent Solution and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The Navy has concluded that the selected remedies at each magazine area represent the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner. Based on the evaluation of all the alternatives that were considered protective of human health and the environment and that complied with ARARs, the selected remedies will provide the best balance of tradeoffs among long-term effectiveness and permanence, implementability, short-term effectiveness, and cost.

- **Preference for Treatment as a Principal Element** – The selected remedy does not satisfy the statutory preference for a remedy that reduces the toxicity, mobility, or volume of hazardous substances through treatment as a principal element. Several treatment technologies for arsenic-contaminated soil were evaluated in the FS; however, these technologies were not selected because of concerns over implementability, short-term effectiveness, high cost, and technical limitations.

- **Five-Year Review Requirements** – The effectiveness of the LUCs for protection of human health at IR Site 22A will be reviewed at 5-year intervals. The purpose of the 5-year review is to verify that the remedy continues to adequately protect human health while the contaminants are present at IR Site 22A at levels that do not allow for unlimited use and unrestricted exposure. The first 5-year review will be submitted 5 years after remedial action is initiated (finalization of the LUC RD).

2.10 COMMUNITY PARTICIPATION

Community participation at the former NAVWPNSTA Concord includes a Restoration Advisory Board (RAB), public meetings, public information repositories, newsletters and fact sheets,

public notices, and an IR Program website. The 2007 Community Involvement Plan Update for the former NAVWPNSTA Concord provides detailed information on community participation for the IR Program and documents interests, issues, and concerns raised by the community regarding ongoing investigation and cleanup at the former NAVWPNSTA Concord.

RAB meetings are held quarterly and are open to the public to provide opportunity for public comment and input; the Navy website

http://www.bracpmo.navy.mil/brac_bases/california/nws_seal_beach_concord/meeting_material.html includes the proposed 2014 meeting dates. Documents and relevant information relied on in the remedy selection process, including the RI, FS, and Proposed Plan, are made available for public review in the information repository. The Proposed Plan can be found on the **IR Program website(27), www.bracpmo.navy.mil**.

Concord Public Library
2900 Salvio Street
Concord, California 94519
Phone: (925) 646-5455

For access to the Administrative Record or additional information on the IR Program, contact:

Ms. Diane Silva
Administrative Records Coordinator
Naval Facilities Engineering Command, Southwest
1220 Pacific Highway
Code EV33, NBSD Bldg. 3519
San Diego, CA 92132-5190
(619) 532-3676

3.0 RESPONSIVENESS SUMMARY

The responsiveness summary is the third component of a ROD; its purpose is to summarize information about the views of the public on both the remedial alternatives and general concerns about the site submitted during the public comment period. The responsiveness summary documents in the public record how public comments were integrated into the decision-making process.

In accordance with CERCLA §§ 113 and 117, the Navy provided a public comment period from November 5, 2012, to December 20, 2012, for the proposed remedial alternative described in the Proposed Plan for IR Site 22A. A public meeting to present the Proposed Plan was held from 6:00 to 8:00 p.m. on December 5, 2012. Public notice of the meeting and availability of documents appeared in the *Contra Costa Times* on November 18, 2012.

The participants in the public meeting included community members, RAB members, and representatives of the Navy and regulatory agencies. Questions and concerns received during the meeting are documented in the **meeting transcript(28).** Responses to comments provided at the meeting and received during the public comment period by the Navy are included in the responsiveness summary (Appendix B).

APPENDIX A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements
Record of Decision for Installation Restoration Site 22A, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Land Use Controls					
State					
California Civil Code[a]					
Land use controls	Provides conditions under which land use restrictions will apply to successive owners of land.	Transfer of property to non-federal ownership.	Cal. Civil Code § 1471	Relevant and appropriate	The Navy will implement land use controls for soil. This section is an ARAR because IR Site 22A is federal land that may be transferred to a non-federal agency.
California Environmental Protection Agency, Department of Toxic Substances Control[a]					
Land use controls	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken; and hazardous materials, hazardous wastes, or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land.	Transfer of property to a non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1 subsections (a)(1), (a)(2), (b), (d), (e)(1), (e)(2), and, as relevant and appropriate, subsections (f) and (i) (definitions for§ 67391.1)	Relevant and appropriate	Cal. Code Regs, tit. 22 § 67391.1 is relevant and appropriate when the Navy is transferring property to a nonfederal agency. EPA Region 9 considers the following portions of Cal. Code Regs. tit. 22 § 67391.1 to be relevant and appropriate for this ROD: (a)(1), (a)(2), (d), (e)(1) ,(e)(2), and, as relevant and appropriate, sub-sections (f) (when it is not feasible to establish an LUC as a component of a remedy for a site) and (i) (definitions for § 67391.1). These requirements are ARARs for the LUCs. DTSC's position is that all of the state regulation is an ARAR.

Notes:

a Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs. Specific ARARs follow each general heading, and only substantive requirements of the specific citations are considered ARARs.

§	Section	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
§§	Sections	DTSC	California Department of Toxic Substances Control
ARAR	Applicable or relevant and appropriate requirement	IR	Installation Restoration
Cal.	California	LUC	Land use control
Cal. Code Regs.	California Code of Regulations	tit.	Title

APPENDIX B
RESPONSIVENESS SUMMARY

Written Comments by Brian Holt from a letter dated December 19, 2012

Affiliation/Agency: East Bay Regional Park District

Comment 1

Dear Mr. Anderson,

The following are comments from the East Bay Regional Park District on the draft Site 22A Proposed Plan ("Plan"), dated November 2012. We appreciate the opportunity to comment on the Plan.

1. Site 22A is primarily located within an area identified as protected open space in the Concord Reuse Project Area Plan. This area is envisioned to become a Regional Park that will incorporate an array of passive recreational uses including hiking, biking, and picnicking. The proposed plan does not explicitly evaluate potential risks associated with recreational use of Site 22A. The Proposed Plan for Site 22A should specifically identify these uses and state that these uses would not be prohibited.
2. Implementation of the Regional Park plans will potentially result in the removal of the bunkers throughout Site 22A. The Proposed Plan for Site 22A should consider the potential for bunker removal and ensure that the selected alternative would be consistent with these plans.
3. The East Bay Regional Park District has not had the opportunity to review the language of covenants that would be placed over Groups 3 and 5 to review for consistency with Regional Park development plans.
4. The East Bay Regional Park District is concerned that the community has been properly informed necessary to ensure community acceptance of the plan. The District notes that the Proposed Plan, the Public Notice, and the notice for the Public Hearing held on December 5th, 2012, have not been posted on the BRAC PMO digital Information Repository ("website") as stated in the Proposed Plan.

Response:

1. As described in the Record of Decision (ROD), the human health risk assessment evaluated potential risks to future industrial workers (protective of park/recreational users, excluding playgrounds), future construction workers (protective of utility and landscape workers), and future adult and child residents (represents an unrestricted land use). As noted in the Proposed Plan and this ROD, the industrial use scenario evaluated in the human health risk assessment is protective of passive recreational use of the site, but does not include playground use. The LUCs employed at Magazine Areas 3 and 5 will not allow the property to be used for residences, hospitals (other than veterinary hospitals), schools for persons under 21 years of age, day care facilities for children, and playgrounds. The objectives of the land use controls (LUC) are described in Sections 2.9.1 and 2.9.2 of the ROD, and a detailed description of the LUCs, will be provided in the LUC remedial design (RD).
2. The implementation of LUCs at Magazine Groups 3 and 5 will not prohibit the removal of bunkers from the site and is consistent with reuse plans.
3. As noted above, the land use restrictions will be detailed in the LUC RD rather than the ROD. The land use covenants will be developed after the LUC RD becomes final.
4. A hard copy of the Proposed Plan was submitted to the community mailing list, which includes more than 500 people. In addition, a public notice was placed in the *Contra Costa Times*, and the public comment period was 45 days rather than the standard 30-day review period. The

Written Comments by Brian Holt from a letter dated December 19, 2012	
Affiliation/Agency: East Bay Regional Park District	
Comment 1	
The East Bay Regional Park District requests an extension of the public comment period for a minimum of 45 days to allow for further evaluation of the Proposed Plan's consistency with the planned uses for Site 22A and that all appropriate stakeholders have been engaged necessary to ensure community acceptance. Thank you for the opportunity to provide comments. Please feel free to contact me at (510) 544-2623 or bholt@ebparks.org should you have any questions. Respectfully, Brian Holt, AICP Senior Planner	Navy's contact information was provided in the proposed plan and public notice as well. The Navy also posted the proposed plan electronically on the Base Realignment and Closure (BRAC) Program Management Office (PMO) website after this comment was received at the public meeting. Therefore, no additional extension of the public comment period will be provided. Department of Defense (DoD) guidance does not require a selected remedy to be consistent with planned reuse (DoD 2006). However, the selected remedy for Magazine Groups 3 and 5, implementations of LUCs, is consistent with the planned reuse as conservation open space. Reference: Department of Defense (DoD). 2006. "Base Redevelopment and Realignment Manual [BRRM]". March 1.

Spoken Comments by Brian Holt received at the public meeting on December 5, 2012	
Affiliation/Agency: East Bay Regional Park District	
Comment 2	
My name is Brian Holt. I'm with the East Bay Regional Park District. I have three concerns regarding the Proposed Plan. The first concern is that the materials have not necessarily been properly noticed on the -- their Web Site, the BRAC PMO Web site, in a way that would enable the Navy and others to be able to gauge community concern as a modifying criteria to the project. The concern regarding the Proposed Plan is specifically regarding Sites 3 and 5 within the magazine areas and the land-use controls, the -- for -- land-use controls restricting residential use. Future plans for that area call for the removal of the bunkers that will potentially cause soil disturbance and future regrading of the site for -- for parks and recreation use, passive recreation use, and habitat conservation. So not necessarily playgrounds, but -- but passive recreational use. So the concern is just as those bunkers are removed, what would the obligation of the Contra Costa County taxpayers be regarding the future regulatory and cleanup requirements for the site? So if there's arsenic in the site that's being kept there by the Navy and if a future landowner were to come in and need to modify the site, would that future landowner be obligated to address the contamination for what is not a residential use? So -- and this just gets at just one of the other criterion there, which was basically a consistency with the Concord reuse plan. So we have just started to review this plan, and these are really just questions at this point, and they intend to submit comments and look into it closer. But that's our concern.	Response: Please refer to the response to Comment 1 above.

Written Comments by Michael Wright from a letter dated December 19, 2012	
Affiliation/Agency: City of Concord	
Comment 3	
Dear Mr. Anderson, The following are comments from the City of Concord on the draft final *Proposed Plan for Installation Program Site 22A, Former Naval Weapons Station, Seal Beach Detachment Concord*, dated October 2012 ("Site 22A PP"). In general, the City has the same comments regarding the site characterization approach that the City provided to the Navy in the previous draft Proposed Plan (see City letter dated 7 August 2012), the Site 22A (Draft Final Feasibility Study) and Site 22 (see e.g., City letter dated 1 February 2011 and City letter dated 12 April 2010 Comment 4 and City letter and attached Erler & Kalinowski, Inc. memorandum dated 30 June 2010). Slightly under half of the Group 2 to 5 magazines have not been characterized for arsenic. Hence, the need for remedial action at these magazines is unknown. The Navy's previous dismissal of this point on the basis of regulatory consent does not change the fact their remedial recommendations are based on incomplete characterization. Detailed City comments about characterization at Site 22A and about arsenic characterization around magazines are included in the attached copies of the comment letters cited above. The City recommends that additional sampling be performed (preferably using multi-increment sampling techniques) to characterize the remaining magazines at Site 22A before a final remedy is selected for the site. We appreciate the opportunity to comment on the Site 22A PP and look forward to discussing these comments with you further. Very Truly Yours, Michael W. Wright Executive Director, Local Reuse Authority	Response: As previously stated in response to comments on the feasibility study, the Navy's characterization approach for Site 22A was established in remedial investigation (RI) scoping meetings with regulatory agencies' approval. The iterative approach was developed with the understanding of the method of arsenic deposition by herbicide spraying. The nature and extent of contamination were determined to be adequately delineated during the RI. Therefore, no additional sampling will be performed.

APPENDIX C
REFERENCES

(Reference Documents Provided on CD)

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
1	**IR Site 22A**	Section 2.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 1.2 through 1.3.3. Tetra Tech EM Inc. (Tetra Tech). June 1, 2009.
2	**explosive materials**	Section 2.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Tables 1-1 and 1-2. Tetra Tech. June 1, 2009.
3	**regional geology**	Section 2.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 2.3. Tetra Tech. June 1, 2009.
4	**Groundwater**	Section 2.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 2.4 and 2.4.1. Tetra Tech. June 1, 2009.
5	**ecology**	Section 2.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 2.5 through 2.5.6. Tetra Tech. June 1, 2009.
6	**Analytical results**	Section 2.3	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Figures 4-1 through 4-5. Tetra Tech. June 1, 2009.
7	**BHHRA**	Section 2.3	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 5.0 through 5.6.5. Tetra Tech. June 1, 2009.
8	**screening-level ecological risk assessment (SLERA)**	Section 2.3	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 6.0 through 6.3. Tetra Tech. June 1, 2009.
9	**Reuse Project Area Plan**	Section 2.4	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Figure 4. ChaduxTt. March 9, 2011.
10	**fate and transport**	Section 2.5	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 7.0. Tetra Tech. June 1, 2009.
11	**chemicals of potential concern (COPC)**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.2. Tetra Tech. June 1, 2009.
12	**exposure assessment**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.3. Tetra Tech. June 1, 2009.
13	**toxicity assessment**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.4. Tetra Tech. June 1, 2009.
14	**risk characterization**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 5.5 through 5.6.5, and Tables 5-1 through 5-4. Tetra Tech. June 1, 2009.
15	**exposure pathways**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.1 and Figure 5-1. Tetra Tech. June 1, 2009.
16	**total risks**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix G: Attachment G1. Tetra Tech. June 1, 2009.
17	**background risks**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix G: Attachment G2. Tetra Tech. June 1, 2009.
18	**incremental risk evaluation**	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix G: Attachment G3. Tetra Tech. June 1, 2009.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
19	**ecological conceptual site model**	Section 2.5.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix H: Sections H2.2 through H2.2.4 and Figure H-1. Tetra Tech. June 1, 2009.
20	**uncertainty**	Section 2.5.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix H: Sections H7.0 through H7.3.9. Tetra Tech. June 1, 2009.
21	**Step 3a risk refinement**	Section 2.5.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix H: Sections H9.0 through H9.5.1. Tetra Tech. June 1, 2009.
22	**general response actions (GRA)**	Section 2.8	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 3.2. ChaduxTt. March 9, 2011.
23	**Present-Value Cost: $659,000**	Table 5	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B, Table B-2. ChaduxTt. March 9, 2011.
24	**Present-Value Cost: $1.73 million**	Table 5	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B, Table B-3B. ChaduxTt. March 9, 2011.
25	**Present-Value Cost: $2.36 million**	Table 5	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B, Table B-4B. ChaduxTt. March 9, 2011.
26	**Cost**	Section 2.8.2	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B. ChaduxTt. March 9, 2011.
27	**IR Program website**	Section 2.10	http://www.bracpmo.navy.mil/
28	**meeting transcript**	Section 3.0	Reporter's Transcript of Public Meeting. December 5, 2012.

[1] **Bold blue text** indicates hyperlinks available on the reference CD; detailed site information contained in the publicly available Administrative Record.

For access to information contained in the Administrative Record for Former Naval Weapons Station Seal Beach Detachment Concord, please contact:

Ms. Diane Silva
Administrative Records Coordination
Naval Facilities Engineering Command, Southwest
1220 Pacific Highway, FISC Building 1, 3rd Floor
San Diego, CA 93132-5190
Telephone: (619) 532-3676
Please call in advance for an appointment Monday through Friday, between 8:30 a.m. and 4:30 p.m.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
1	IR Site 22A	Section 2.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 1.2 through 1.3.3. Tetra Tech EM Inc. (Tetra Tech). June 1, 2009.

- Appendix H, Screening-Level Ecological Risk Assessment and Step 3a Risk Refinement
- Appendix I, Responses to Regulatory Agency Comments on the Draft and Draft Final Remedial Investigation Reports for Installation Restoration Site 22A

1.2 SITE BACKGROUND

This section describes the facility history, site description, site history, current use of Site 22A, and previous investigations conducted at Site 22A.

1.2.1 Facility History

In December 1942, the Navy commissioned the ordnance shipping depot at Naval Magazine, Port Chicago, now known as the Tidal Area of the Former NAVWPNSTA Seal Beach Det Concord. When munitions passing through the Port Chicago waterfront began to exceed the capacity of the facility, the Navy acquired a 5,143-acre parcel of land in the Diablo Creek Valley. This land became the Inland Area of the Former NAVWPNSTA Seal Beach Det Concord (Ecology & Environment, Inc. 1983).

Former operations in the Inland Area included receiving both containerized and break-bulk munitions for inspection and classification. Munitions were held while they awaited transportation. Six magazine groups for ammunition storage were used in the Inland Area. The Inland Area also housed several production support facilities for weapons, as well as vehicle maintenance facilities; however these production support facilities were not in Site 22A. The northwestern corner of the Inland Area included an administrative complex, the public works department, and personnel housing that were used to support the munitions operations.

Since 1999, the Inland Area and site have been mostly inactive. The Inland Area was identified for closure in fall 2005 as part of the nationwide Base Realignment and Closure Program.

1.2.2 Site Description

Site 22A is located within the southwestern portion of the Inland Area of Former NAVWPNSTA Seal Beach Det Concord (see Figures 1-1 and 1-2). Site 22A consists of five subareas (Groups 1 through 5) with a total acreage of 504 acres, 102 munitions storage magazines connected by roads and railroad spurs, and surrounding open grassland in Los

Medanos Hills northeast of Mount Diablo/Seal Creek. The number of magazines in each area and the acreage are listed below.

- Group 1 – 6 magazines; 2.4 acres
- Group 2 – 39 magazines; 154 acres
- Group 3 – 17 magazines; 39 acres
- Group 4 – 20 magazines; 124 acres
- Group 5 – 20 magazines; 185 acres

Site 22A surface water bodies and surface drainage flow directions and shown on Figure 1-3. Cistern Pond, a perennial pond that collects water from seasonal rains, is located within the Group 4 area near a 3-acre rock quarry. No other perennial surface water bodies are located within the boundaries of the Site 22A.

1.3 SITE HISTORY

To support wartime activities, the magazines in Groups 1 through 5 were constructed during the mid-1940s on agricultural land. The Navy stored ammunition and explosives in the magazines from the mid-1940s to 2001. Table 1-1 lists the explosive fillers associated with ordnance and explosive items that may have been stored in the magazines (Navy 1993). Information on the specific types of explosives and ordnance stored in the magazines is presented in Table 1-2 (Weston 2005). Generation of waste or disposal of ordnance materials would occur in a magazine if ordnance items or articles were accidentally damaged or had deteriorated. , Each magazine was inspected and certified for closure between February 2000 and March 2001. Closure was defined as "visibly free of all ammunition, explosives, and/or explosive residue" (Navy 2004). In March 2007, all Inland Area buildings and storage magazines were inspected by Naval Surface Warfare Center personnel to determine if any of the buildings contained explosive hazards from previous use. A historical records search, a review of building drawings, and a visual site inspection were performed at all buildings. Quantitative samples were collected from a subset of buildings and magazines and analyzed for ammonium picrate, trinitrotoluene (TNT), cyclotrimethylenetrinatramine (RDX), cyclotetramethylenetetranitramine (HMX), tetryl, and nitrocellulose (NC), where warranted. No munitions constituents were detected in any of the Site 22 magazines at concentrations above hazard threshold limits. The report concluded that no residual explosives hazard exists in any of the magazine storage bunkers in the Inland Area (Naval Surface Warfare Center 2007). The sampling protocol and methods used for the March 2007 inspection are provided in Appendix A (titled "Appendix B. Sampling Protocol and Methods").

Magazines that may have been used to store "Special Weapons" are being investigated further as part of other investigations, such as the Historical Radiological Assessment for the Inland Area at the Former NAVWPNSTA Seal Beach Det Concord. In addition, the Navy has conducted an archival record search on possible chemical warfare materials (CWM), and the results are presented in a report prepared in December 2001 by Roy F. Weston, Inc. titled: "Archival Search Report, Concord Naval Weapons Station Historical Investigation of Possible CWM Activities Conducted at Concord NWS" (Weston 2001), and provided in Appendix A.

Interviews with Margaret Wallerstein of the Navy, Paul Pudenz, a former Navy worker in the area, and Richard Pieper, director of Public Works at the facility, indicated that the magazines were used strictly for storage. All three interviewees had no knowledge of any spill or release in the magazine area. According to Mr. Pieper, who worked at Former NAVWPNSTA Seal Beach Det Concord from 1982 to 2008, any residue observed in the magazines would have been contained in accordance with then-current standard operating procedures.

The magazine areas at Site 22A were not identified for further investigation during the basewide initial assessment study (Ecology and Environment Inc. 1983). Because the site use history for Site 22A is similar to Site 22 (the Group 6 Magazine Area), these magazines were identified for assessment of arsenic in soil.

Inorganic arsenate was a commonly applied pesticide during the pre-World War II era (University of Iowa College of Public Health 2003), and its primary use was as a pesticide on cotton fields and orchards (Agency for Toxic Substances and Disease Registry [ATSDR] 2004). Review of aerial photographs from 1939 indicated that the land encompassing Site 22A, as well as the adjacent off-site properties, was used for agriculture, including walnut orchards.

During review of potential sources of arsenic in the Inland Area, the Navy identified a historical newspaper article (*Contra Costa Gazette* 1947), which indicated that an herbicide, "sodium arsenite," that contained arsenic, was used on "undergrowth on top and within 50 feet of munitions [magazines] to kill tall grass" that represented a fire hazard (*Contra Costa Gazette* 1947). Based on this article, the Navy hypothesized that the source of arsenic at both Sites 22 and 22A was the application of arsenic-containing herbicides for weed control and possibly from historic burning of arsenic contaminated hay. Results of previous sampling at the Groups 2 through 5 Magazine Areas (formerly known as Magazine Areas A through D) indicated arsenic was present in surface soil at concentrations exceeding the background concentration (10 mg/kg). These results further supported the Navy's hypothesis that the concentrations elevated above background were the result of application of arsenic-containing herbicides to control the fire hazard from vegetation around the magazines during the late 1940s.

1.3.1 Pest Management

Information on historical application of herbicides and pesticides at the facility is limited. As indicated in a 1947 newspaper article from the *Contra Costa Gazette* (Appendix A), the Navy may have used an arsenic-containing herbicide to control vegetation to prevent fire danger on and around the magazines. Sodium and lead arsenate were commonly applied pesticides and herbicides in the 1940s (University of Iowa College of Public Health 2003). The Navy reviewed all records at the National Information Technology Center, which maintains the Navy pesticide use database, but no records on historical use of arsenic-containing pesticides or herbicides were identified (Navy 2002).

Arsenic-based rodenticides were also used historically (primarily in the 1960s) to control rodents and ground squirrels. However, a 1954 newspaper article from the *Contra Costa Gazette* indicates that methyl bromide, a fumigant, was used at the base to control ground

squirrel populations (Appendix A). Methyl bromide does not leave behind toxic agents in soil. Methyl bromide is being phased out by EPA because it is an ozone-depleting gas (EPA 2006).

According to the initial assessment study, which was prepared in June 1983, the facility maintenance group operated a pesticide shop, which was responsible for insect and rodent control at the facility, as well as vegetation control along streets, sidewalks, and buildings (Ecology and Environment, Inc. 1983). Subcontractors were used for large-scale vegetation control along roadsides and pastureland (Ecology and Environment, Inc. 1983). When the initial assessment study was written, the following pesticides and herbicides were used: Krovar 1 (weed control), Roundup (roadside weed control), Dusban and Ficam (insect control), methyl bromide (poison bait for ground squirrels) and aminotiazole and 4-(2,4-dichlorophenoxy)butyric acid to control broadleaf vegetation. The initial assessment study provides a table of herbicides and pesticides used at the facility. The source referenced for this table is the 1979-1980 Pesticide Management Plan.

In 1997, Former NAVWPNSTA Seal Beach Det Concord developed a pest management plan (Navy 1997). The pest management plan applied an integrated pest management program that emphasized the use of cultural, biological, physical, educational, and mechanical methods of pest control and limited the use of chemical pesticides. The Navy used several different insecticides, rodenticides, and herbicides to control pest populations in areas and times where pesticide use was necessary. For example, herbicides were used along railroad tracks and in the cracks of sidewalks to reduce weeds.

Controlled burns have been conducted in the past to manage weeds and insects at Site 22A. The rodent population at Site 22A is currently not controlled.

1.3.2 Site 22A Current Use

The Navy manages resources in the Inland Area in accordance with the Integrated Natural Resources Management Plan (Tetra Tech, Inc. 2002). The Navy currently leases the area that encompasses the Inland Area magazines for cattle grazing from September to March (Navy 1993). The yearly frequency of visits by ranchers on Site 22A is as follows: (1) checking on cattle, about 26 events at 1 to 2 hours per event; (2) moving cattle, about four events at 4 hours per event; and (3) clearing brush, about two events at 6 to 8 hours per event (Navy 2006b). Ranchers, security personnel, fire protection specialists, and investigators under the CERCLA infrequently visit the site.

1.3.3 Site 22A Previous Investigations

Previous investigations conducted at Site 22A consisted of characterization of surface soil at the Groups 2 through 5 Magazine Areas. In December 2005, 30 surface soil samples were collected from these four areas and analyzed for arsenic. The results of the December 2005 investigation indicated that arsenic concentrations in soil within the open areas were below the background concentration and that arsenic concentrations in soil within areas near the magazines were above the background concentration. These findings were consistent with the working hypothesis that arsenic-containing herbicides were applied to control the fire hazard from vegetation around these structures.

TABLE 1-1: PERCENTAGE OF MATERIAL FILLER IN EXPLOSIVES AND ORDNANCE THAT MAY HAVE BEEN STORED IN THE INLAND AREA MAGAZINES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord California

Filler	Use	TNT	RDX	HMX	DNT	Potassium Nitrate
Composition A	Projectile fillers, boosters, grenades, and shaped chargers		91-98%			
Composition B	High energy projectiles, grenades, shaped charges, and fragmentation charges	40%				
Cyclotol	High energy projectiles, grenades, shaped charges, and bursting charges	25%	75%			
HBX	High energy projectiles and projectile fillers	29%		49%		
Black Powder	Igniter powder and time fuzes					40-60%
Octols	High energy projectiles, shaped charges, and bursting charges	25-35%			70-75%	

Notes:

DNT Dinitrotoluene
HBX High brissance explosive
HMX Cyclotetramethylene-tetranitramine (the abbreviation is for "high melting explosive")
RDX Cyclotrimethylene trinitramine
TNT 2,4,6-Trinitrotoluene

Source:

Navy Explosive Ordnance Bulletin, Army Technical Memorandum, Air Force Training Technical Objective. 1993. "Explosive Ordnance Disposal Procedures, Description and Disposal for Conventional Explosives and Related Hazardous Materials." October 27. Revision 4.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
2	explosive materials	Section 2.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Tables 1-1 and 1-2. Tetra Tech. June 1, 2009.

TABLE 1-2: SUMMARY OF FORMER AND CURRENT USAGE OF MAGAZINES, SITE 22A
Remedial Investigation Report for Installation Restoration Site 22A,
Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Facility Number	Former Use	Current Use	Investigations/Notes
Group 1 Magazines			
1XT-1	Powder and Propellant Samples[a]	Not in use[b]	Visual inspection[c]
1XT-2	Powder and Propellant Samples[a]	Not in use[b]	Visual inspection[c]
1XT-3	Powder and Propellant Samples[a]	Not in use[b]	Visual inspection[c]
1XT-4	Powder and Propellant Samples[a]	Not in use[b]	Visual inspection[c]
1XT-5	Powder and Propellant Samples[a]	Not in use[b]	Visual inspection[c]
1XT-6	Powder and Propellant Samples[a]	Not in use[b]	Visual inspection[c]
Group 2 Magazines			
2AT-1	Fuze and Det. Magazine	Not in use[b]	Visual inspection[c]
2AT-2	Fuze and Det. Magazine	Not in use[b]	Visual inspection[c]
2AT-3	Fuze and Det. Magazine	Not in use[b]	Visual inspection[c]
2AT-4	Fuze and Det. Magazine	Not in use[b]	Visual inspection[c]
2AT-5	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-6	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-7	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-8	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-9	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-10	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-11	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-12	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-13	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-14	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-15	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-16	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-17	Special Weapons	Not in use[b]	Visual inspection[c]

TABLE 1-2: SUMMARY OF FORMER AND CURRENT USAGE OF MAGAZINES, SITE 22A (CONTINUED)
Remedial Investigation Report for Installation Restoration Site 22A,
Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Facility Number	Former Use	Current Use	Investigations/Notes
2AT-18	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-19	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-20	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-61	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-62	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-63	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-64	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-65	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-66	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-67	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-68	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-69	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-70	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-71	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-72	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-73	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-74	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-75	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-76	Special Weapons	Not in use[b]	Visual inspection[c]
2AT-77	Special Weapons	Not in use[b]	Visual inspection[c]
2AC-78	Special Weapons	Not in use[b]	Visual inspection[c]
Group 3 Magazines			
38T-1	Black Power	Not in use[b]	Visual inspection[c]
38T-2	Black Power	Not in use[b]	Visual inspection[c]

TABLE 1-2: SUMMARY OF FORMER AND CURRENT USAGE OF MAGAZINES, SITE 22A (CONTINUED)
Remedial Investigation Report for Installation Restoration Site 22A,
Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Facility Number	Former Use	Current Use	Investigations/Notes
38T-3	Black Power	Not in use[b]	Visual inspection[c]
38T-4	Black Power	Not in use[b]	Visual inspection[c]
38T-5	Black Power	Not in use[b]	Visual inspection[c]
3FT-1	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-2	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-3	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-4	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-5	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-6	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-7	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-8	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-9	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-10	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-11	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-12	Fuze Detonator	Not in use[b]	Visual inspection[c]
3FT-13	Fuze Detonator	Not in use[b]	Visual inspection[c]
Group 4 Magazines			
4AT-21	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-22	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-23	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-24	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-25	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-26	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-27	HE Magazine/RI	Not in use[b]	Visual inspection[c]

TABLE 1-2: SUMMARY OF FORMER AND CURRENT USAGE OF MAGAZINES, SITE 22A (CONTINUED)
Remedial Investigation Report for Installation Restoration Site 22A,
Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Facility Number	Former Use	Current Use	Investigations/Notes
4AT-28	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-29	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-30	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-31	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-32	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-33	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-34	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-35	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-36	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-37	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-38	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-39	HE Magazine/RI	Not in use[b]	Visual inspection[c]
4AT-40	HE Magazine/RI	Not in use[b]	Visual inspection[c]
Group 5 Magazines			
5AT-41	HE Magazine - Bulk	Not in use[b]	Visual inspection[c]
5AT-42	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-43	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-44	GM Magazine - Bulk	Not in use[b]	Visual inspection[c]
5AT-45	GM Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-46	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-47	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-48	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-49	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-50	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]

TABLE 1-2: SUMMARY OF FORMER AND CURRENT USAGE OF MAGAZINES, SITE 22A (CONTINUED)
Remedial Investigation Report for Installation Restoration Site 22A,
Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Facility Number	Former Use	Current Use	Investigations/Notes
5AT-51	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-52	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-53	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-54	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-55	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-56	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-57	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-58	HE Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-59	GM Magazine – Bulk	Not in use[b]	Visual inspection[c]
5AT-60	GM Magazine – Bulk	Not in use[b]	Visual inspection[c]

Notes:

a Small ordnance items (powder and propellant) samples for testing at the Weapons Quality Engineering Center. Information provided by Robert Guyman.

b Sealed and cleaned

c All magazines were inspected by Navy personnel as a separate action from the final Inland Area ESR. Original inspection forms are available in the Naval Weapons Station Seal Beach Detachment Concord Environmental Office. No significant findings were identified and there was no indication of a spill in this magazine (Navy 2004).

ESR Environmental Status Report
GM Guided Missile
HE High Explosives
RI Receipt & Inspection

Reference:

Weston Solutions, Inc. 2005. "Final Environmental Status Report 2005 Update for the Naval Weapons Station Seal Beach Detachment Concord Inland Area." March.

Navy. 2004. "Informal Dispute Resolution Summary and Proposed Sampling at the Magazine Area and Installation Restoration Sites 22, 27 and 29 at Naval Weapons Station Seal Beach, Detachment Concord, Concord, California. March 15.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
3	regional geology	Section 2.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 2.3. Tetra Tech. June 1, 2009.

The mean annual precipitation for Former NAVWPNSTA Seal Beach Det Concord is 14 inches (Ecology and Environment, Inc. 1983). As in most of northern California, about 84 percent of the rainfall occurs from November through March. Regionally, rainfall may vary from 13 inches in the eastern portion of Contra Costa County to more than 30 inches on the upper slopes of Mount Diablo. Continuous rainfall recordings are available for Martinez, 10 miles west of Former NAVWPNSTA Seal Beach Det Concord. Short-duration rainfall events and peak watershed discharges may be estimated for the various study sites by multiplying Martinez precipitation data by a factor of 0.716; this factor represents the ratio of 1-day precipitation at Port Chicago to 1-day precipitation at Martinez (Lee and others 1986).

The average local temperature varies from 45 °F in January to 75 °F in August. In 1960, a high of 106 °F in August and a low of 17 °F in January were recorded. The record low was 16 °F during a hard freeze in December 1972. The average frost-free season is about 265 days.

2.3 GEOLOGY

The generalized geology of Former NAVWPNSTA Seal Beach Det Concord is presented in Figure 2-1, which includes a simplified geologic map and cross section that shows the stratigraphic relationships of the various units described in the following text. Lithologic logs for soil borings within Site 22A are presented in Appendix C.

The regional geomorphic features are a reflection of several northwest-trending fault systems that divide Contra Costa County into fault-bounded blocks; up-thrown blocks form the hills, and down-thrown blocks form broad lowlands floored with thick, unconsolidated, Pleistocene alluvial soils eroded from material that makes up the up-thrown blocks. The up-thrown block of bedrock that physically separates the Inland and Tidal Areas is typical of the geology of Contra Costa County. The oldest formations are Tertiary sedimentary rocks exposed in Los Medanos Hills along the east side of Former NAVWPNSTA Seal Beach Det Concord (Dibblee 1981).

The Concord Fault passes through the City of Concord, 2 miles from the southwest boundary of Former NAVWPNSTA Seal Beach Det Concord. Figure 2-1 shows the two major faults known to exist in the area of Former NAVWPNSTA Seal Beach Det Concord. The Concord Fault is an active right-lateral strike-slip fault. (Rocks on the southwestern side of the fault are displaced to the northwest relative to rocks on the northeastern side.) The Concord Fault is part of the San Andreas system and is thought to be either the northwest extension of the Calaveras Fault, a seismically active fault, or related to the relatively inactive Greenville Fault southeast of Mount Diablo.

The main trace of the Clayton Fault lies at the base of Los Medanos Hills, passing through Former NAVWPNSTA Seal Beach Det Concord in most places less than 0.5 mile from the installation's northeastern boundary. The Clayton Fault is classified as active or potentially active (Nelson 1993). Several lineaments, possibly related to faulting and fault displacement, are present west of the main trace of the Clayton Fault. The Clayton Fault is most likely a dip-slip fault. (Rocks on the southwestern side are dropped down relative to rocks on the northeastern side and run subparallel to the larger Concord Fault.) It is most likely dropped down to the southwest (Dibblee 1981). The Clayton Fault may be related to a series of northwest-trending structural features: the Marsh Creek-Greenville Fault, and the Arroyo Mocha Fault.

Site 22A is located along the southwest facing slope of Los Medanos Hills. Dibblee mapped the area as Los Medanos Hills bedrock (Pliocene nonmarine sedimentary rocks, Pliocene pumiceous tuff breccias, Miocene marine sandstones, and Eocene sandstone) and by Quaternary young alluvium (see Figure 2-1).

Soil borings completed at the site in January 2008 indicate that alluvial deposits extend from the surface to deeper than 10 feet below ground surface (bgs). The geology consists primarily of silty clay and silt with varying amounts of sand and trace angular gravel.

2.4 HYDROLOGY

The hydrology of the region can be divided into surface water and groundwater. Surface water hydrology includes features of streams, lakes, bays, and estuaries. The regional groundwater hydrology includes both potable and nonpotable groundwater.

The major surface drainage systems of the San Francisco Bay Area can be classified as (1) the Great Valley and Delta systems; (2) streams that flow into the San Francisco, San Pablo, or Suisun Bays; and (3) streams that flow directly into the Pacific Ocean. Surface water drainage and groundwater flow that are locally relevant to the site are described below.

Site 22A is located within the Mount Diablo Watershed, which drains to Suisun Bay. The principal drainage for this watershed is Mount Diablo Creek, which is referred to as Seal Creek once it enters Former NAVWPNSTA Seal Beach Det Concord. The main stem of Mount Diablo/Seal Creek flows through agricultural land in the upper part of the watershed, then passes through the Cities of Clayton and Concord and Former NAVWPNSTA Seal Beach Det Concord before it enters the marshes at Suisun Bay (Contra Costa Resource Conservation District 2006). Some overland flow at Site 22A is toward Mount Diablo/Seal Creek, through a network of drainage ditches on the site. Flow in Mount Diablo/Seal Creek is intermittent, occurring primarily during the winter rainy season. Figure 1-3 shows the direction of surface drainage flow at the Groups 1 through 5 Magazine Areas. Historical records show that some degree of flooding occurs during normal precipitation years along portions of the creek near the Tidal Area; however, the section of the creek that runs through the Inland Area is not a source of severe overbank flooding because the channel is deeply incised.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
4	Groundwater	Section 2.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 2.4 and 2.4.1. Tetra Tech. June 1, 2009.

west of the main trace of the Clayton Fault. The Clayton Fault is most likely a dip-slip fault. (Rocks on the southwestern side are dropped down relative to rocks on the northeastern side and run subparallel to the larger Concord Fault.) It is most likely dropped down to the southwest (Dibblee 1981). The Clayton Fault may be related to a series of northwest-trending structural features: the Marsh Creek-Greenville Fault, and the Arroyo Mocha Fault.

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Groundwater beneath the Inland Area is commonly found in the coarser sand and gravel units of the unconsolidated alluvium at depths between 30 to 50 feet, under semiconfined conditions. No groundwater wells are located at Site 22A; therefore, the depth to groundwater at Site 22A is unknown. Based on the surface topography (see Figure 1-3), groundwater is expected to flow to the southwest.

2.4.1 Groundwater Potability

The Navy has not assessed the potability of groundwater at Site 22A because the Navy has not evaluated total dissolved solids concentrations in groundwater or the well yield at Site 22A. As a result, groundwater at Site 22A is considered a potential source of drinking water, and the data for Site 22A were assessed assuming the groundwater is a potential source of drinking water in the RI Report. Potable water at Site 22A and the surrounding areas is supplied from treated water sources from Contra Costa Water District (Contra Costa Water District 2005). The drinking water supply for the Contra Costa Water District originates from surface water from the Sacramento-San Joaquin Delta and is conveyed through a canal. This canal is located more than 1.2 miles from Site 22A.

According to the 1995 San Francisco Basin Plan, the existing beneficial use of groundwater at the site is for municipal and domestic water supply (San Francisco Bay Regional Water Quality Control Board 1995). Other potential beneficial uses identified include industrial process water supply, industrial service water supply, agricultural water supply, and freshwater replenishment supply to surface water.

The Navy requested information from the Contra Costa Health Department on private drinking water supply wells within 1 mile of Site 22A in 2003. No drinking water wells were identified (Contra Costa County Health Services Department 2003). However, it was noted at a community meeting that unpermitted wells on private property may be used as sources of drinking water. No irrigation wells are located on Site 22A. However, irrigation wells located off site include wells at Gehringer Pool Club, the high school, a 40-acre park on Concord Boulevard, Diablo Creek Golf Course, and several agricultural wells at the Dana Estates.

2.4.2 Stormwater Management

Most of the surface flow at Site 22A is collected in drainage ditches that are directed to the south and southwest toward Mount Diablo/Seal Creek, as shown on Figure 1-3. Former NAVWPNSTA Seal Beach Det Concord has implemented a stormwater pollution plan to reduce or eliminate pollutants discharged to U.S. waters (CH2M Hill 2001). Stormwater runoff from the drainage ditches at Site 22A has been analyzed yearly during the wet season. Site 22A has not been identified as potentially impairing stormwater quality. The outfall that receives water from Site 22A was dropped from the monitoring program because industrial activities in that area had ceased (CH2M Hill 2001).

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
5	ecology	Section 2.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 2.5 through 2.5.6. Tetra Tech. June 1, 2009.

bottom of this canal because of erosion along its length and it is overgrown with vegetation. The Navy has collected soil and sediment samples within Clayton Canal, as documented in the 2007 RI report for Site 22 (Tetra Tech 2007a). According to Jeff Quimby of the Contra Costa Water District, the canal was formerly used to deliver water from the water district's main canal to irrigation customers in eastern Concord (Contra Costa Water District 2005). Mr. Quimby indicated that water in the Clayton Canal at the station flowed southeast. Since the Clayton Canal no longer contains water, it is not a habitat for fish.

2.5 ECOLOGICAL SETTING

Information was compiled on the ecological setting, such as the habitats, animal and plant species, and special status species that could be exposed to site-related chemicals of potential ecological concern. The Navy manages natural resources in the Inland Area in accordance with the Integrated Natural Resources Management Plan (Tetra Tech, Inc. 2002). The Integrated Natural Resource Management Plan was developed in accordance with the Sikes Improvement Act of 1997. The Sikes Improvement Act authorizes the Secretary of Defense to develop plans at military facilities to protect, conserve, and enhance wildlife, fish, and game resources to the maximum extent practicable on public lands consistent with applicable land use and management plans. The Integrated Natural Resource Management Plan was prepared for the entire facility and is not specific to Site 22A. From July 1998 to September 1999, the University of Arizona Advanced Resource Technology Group characterized and mapped natural resources at Former NAVWPNSTA Seal Beach Det Concord (Downard, Guertin, and Morrison 2000). The purpose of this project was to identify and describe the seasonal presence, distribution, and abundance of wildlife and plant communities that occur at Former NAVWPNSTA Seal Beach Det Concord. Additional surveys and evaluations have been conducted for amphibians in the Inland Area (EDAW, Inc. 2008; Tierra Data, Inc. 2008). Again, although ecological surveys were conducted throughout the Inland Area, the surveys were not specific to Site 22A. Information presented below is based on the ecological surveys of the Magazine Area (Site 22) and Groups 1 through 5 Magazine Areas (Site 22A) at Former NAVWPNSTA Seal Beach Det Concord and the Integrated Natural Resource Management Plan.

2.5.1 Plants

Site 22A is located in an annual grassland with storage buildings, ammunition magazines, open space, and a network of roads and railroads. Site 22A has been disturbed through clearing, grazing, burning, grading, and other human activities. Dominant plant species are primarily nonnative or invasive grass species such as wild oat (*Avena fatua*), ripgut grass (*Bromus diandrus*), Mediterranean barley (*Hordeum marinum*), and Italian rye grass (*Lolium multiflorum*). A nonnative forb species, star thistle (*Centaurea solstitialis*), is widely

distributed within grasslands in the Inland Area (Downard, Guertin, and Morrison 2000; Tetra Tech, Inc. 2002).

A wetland delineation conducted in 2007 (Tierra Data, Inc. 2008) found jurisdictional wetland within Group 4 Magazine Area (see Figure 1-3). No other jurisdictional or non-jurisdictional waters or wetlands occur at Site 22A (see Figure 1-3). In addition, no special status plant species are known to occur at Site 22A.

2.5.2 Invertebrates

Site 22A provides suitable habitat for soil invertebrates and insects. No special-status invertebrates are known to occur at the Site (California Department of Fish and Game [CDFG] 2008).

2.5.3 Amphibians and Reptiles

Seven amphibian and 15 reptile species were observed at Former NAVWPNSTA Seal Beach Det Concord from July 1998 to September 1999. Among the amphibian species observed, two are federally or state listed as sensitive. California red-legged frogs (*Rana aurora draytonii*) are federally listed as threatened and state listed as a species of special concern. California tiger salamanders (*Ambystoma californiense*) were also observed within the Inland Area and use the ponds there. This species is also listed as threatened. Proximity to an ephemeral or perennial water source was the primary factor in selecting the fixed sites for the survey since amphibian species require water during their life cycle. Mount Diablo/Seal Creek, which is located near Groups 1 through 5 Magazine Areas and contains water during the wet season, may be habitat for these species (Contra Costa Resource Conservation District 2006). In particular, Cistern Pond in Group 4 could provide suitable habitat for amphibians (see Figures 1-3 and 1-4). Groups 3 and 5 could also provide habitat for amphibians. The range of the species would include the grassland area of Site 22A. Groups 4 and 5 have more suitable habitat for the California tiger salamander than Groups 1, 2, and 3, based on the density of small mammal burrows, which the salamanders may use in the upland area, the proximity to breeding ponds, and reported occurrences (EDAW, Inc. 2008).

2.5.4 Birds

Bird surveys were conducted in Groups 1 through 5 Magazine Areas throughout a 1-year observation period (Downard, Guertin, and Morrison 2000). Table 2-1 is a complete list of birds observed in the magazine area during the 1998 and 1999 surveys. Dominant species included the American goldfinch *(Carduelis tristis)*, American robin *(Turdus migratorius)*, Anna's hummingbird *(Calypte anna)*, Bullock's oriole *(Icterus bullockii)*, California towhee *(Pipilo crissalis)*, European starling *(Sturnus vulgaris)*, golden-crowned sparrow *(Zonotrichia atricapilla)*, house finch *(Carpodacus mexicanus)*, mourning dove *(Zenaida macroura)*, northern mockingbird *(Mimus polyglottos)*, spotted towhee *(Pipilo maculates)*, western kingbird *(Tyrannus verticalis)*, western meadowlark *(Sternella neglecta)*, white-crowned sparrow *(Zonotrichia leucophrys)*, and yellow-rumped warbler *(Dendroica coronata)*. The loggerhead

shrike (*Lanius ludovicianus*), a California species of special concern, was observed in the grasslands of the Inland Area (Tetra Tech, Inc. 2002).

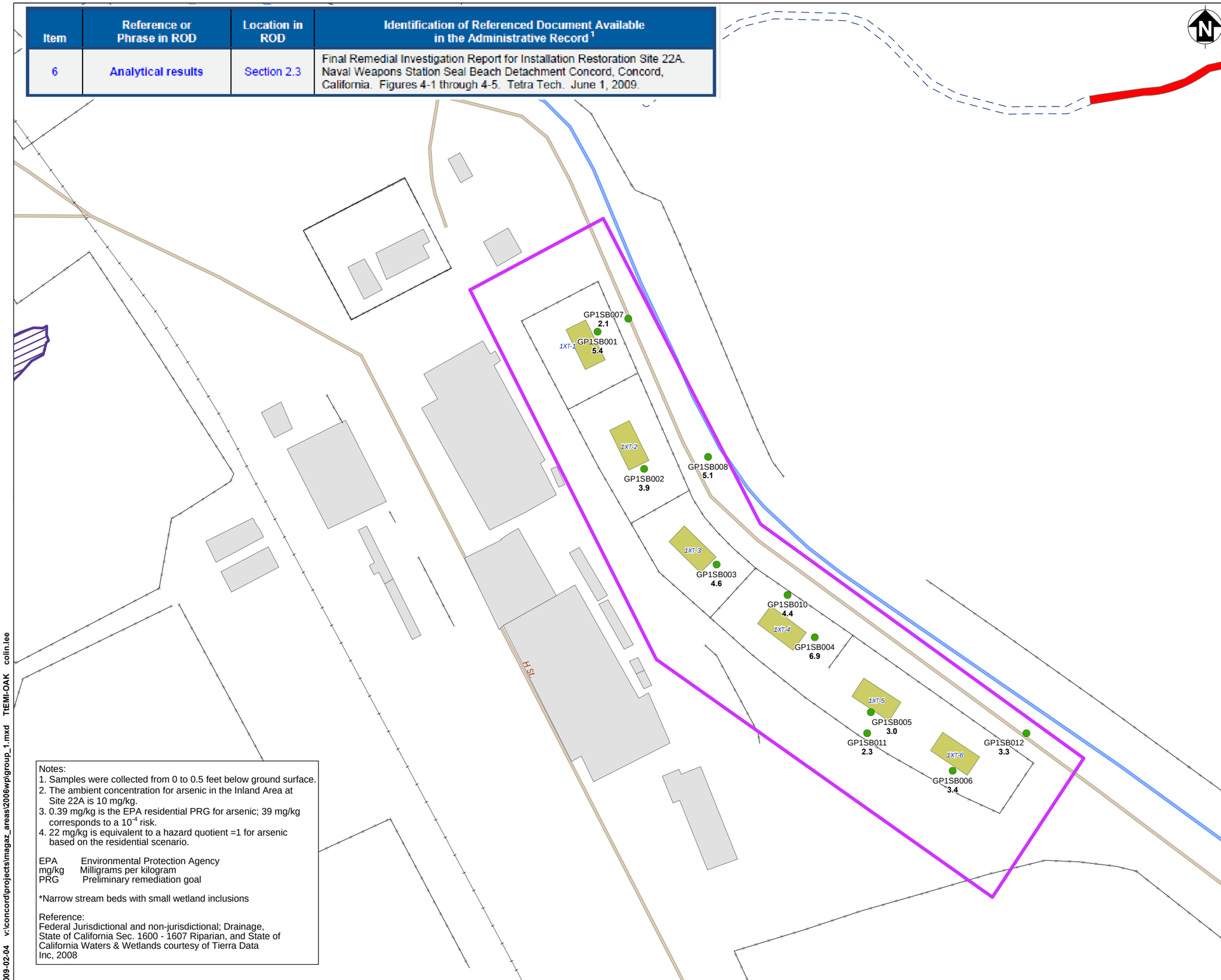
2.5.5 Mammals

The mammals potentially present at Site 22A include species of rodents and larger mammals. Rodents observed in and around Site 22A include deer mice *(Peromyscus maniculatis)*, western harvest mice *(Reithrodontomys megalotis)*, house mice (*Mus musculus)*, and California voles *(Microtus californicus)*. Larger mammals potentially present include raccoons *(Procyon lotor)*, badgers *(Taxidea taxus)*, striped skunks *(Mephitis mephitis)*, grey foxes *(Urocyon cinereoargenteus)*, coyote *(Canis latrans)*, California ground squirrels *(Spermophilus beecheyi)*, fox squirrels *(Sciurus niger)*, black-tailed jackrabbits *(Lepus californicus)*, and cattle (*Bos taurus*). Table 2-2 is a complete list of mammals observed in or around Site 22A during the 1998 and 1999 surveys (Downard, Guertin, and Morrison 2000).

2.5.6 Special Status Species

Special status species observed at Site 22A include the California red-legged frog and California tiger salamander, both federally listed as threatened. Amphibian sightings have been limited to Groups 4 and 5, but the California tiger salamander could also occur in Groups 1, 2, and 3 (EDAW, Inc. 2008; Tierra Data, Inc. 2008). Other special status species that may occur at the site include, but are not limited to, the following birds that are California species of special concern: loggerhead shrike (*Lanius ludovicianus*), Suisun song sparrow (*Melospiza melodia maxillaries*), and northern harrier (*Circus cyaneus*). Other special status species may potentially occur at the site (Tetra Tech Inc. 2002).

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
6	Analytical results	Section 2.3	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Figures 4-1 through 4-5. Tetra Tech. June 1, 2009.

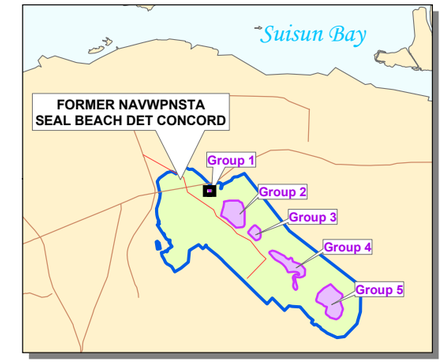


Notes:
1. Samples were collected from 0 to 0.5 feet below ground surface.
2. The ambient concentration for arsenic in the Inland Area at Site 22A is 10 mg/kg.
3. 0.39 mg/kg is the EPA residential PRG for arsenic; 39 mg/kg corresponds to a 10^{-4} risk.
4. 22 mg/kg is equivalent to a hazard quotient =1 for arsenic based on the residential scenario.

EPA Environmental Protection Agency
mg/kg Milligrams per kilogram
PRG Preliminary remediation goal

*Narrow stream beds with small wetland inclusions

Reference:
Federal Jurisdictional and non-jurisdictional; Drainage, State of California Sec. 1600 - 1607 Riparian, and State of California Waters & Wetlands courtesy of Tierra Data Inc, 2008



2007 Tier I Sampling Location (0 to 0.5 ft bgs)
Group 1 Magazine Area Boundary
Ammunition Magazine
Former NAVWPNSTA Seal Beach Det Concord Boundary

Federal

Jurisdictional Waters of the U.S.
Jurisdictional Waters w/Wetlands*
Jurisdictional Wetlands

State

Sec. 1600-1607, California Fish & Game Code
Building
Street
Railroad
Fence Line

GP4SB001
4.5
Sampling Station ID
Arsenic Concentration in mg/kg.

Concentration of Arsenic:
Result Less than 10 mg/kg

70 0 70
Feet

TETRA TECH EM INC.

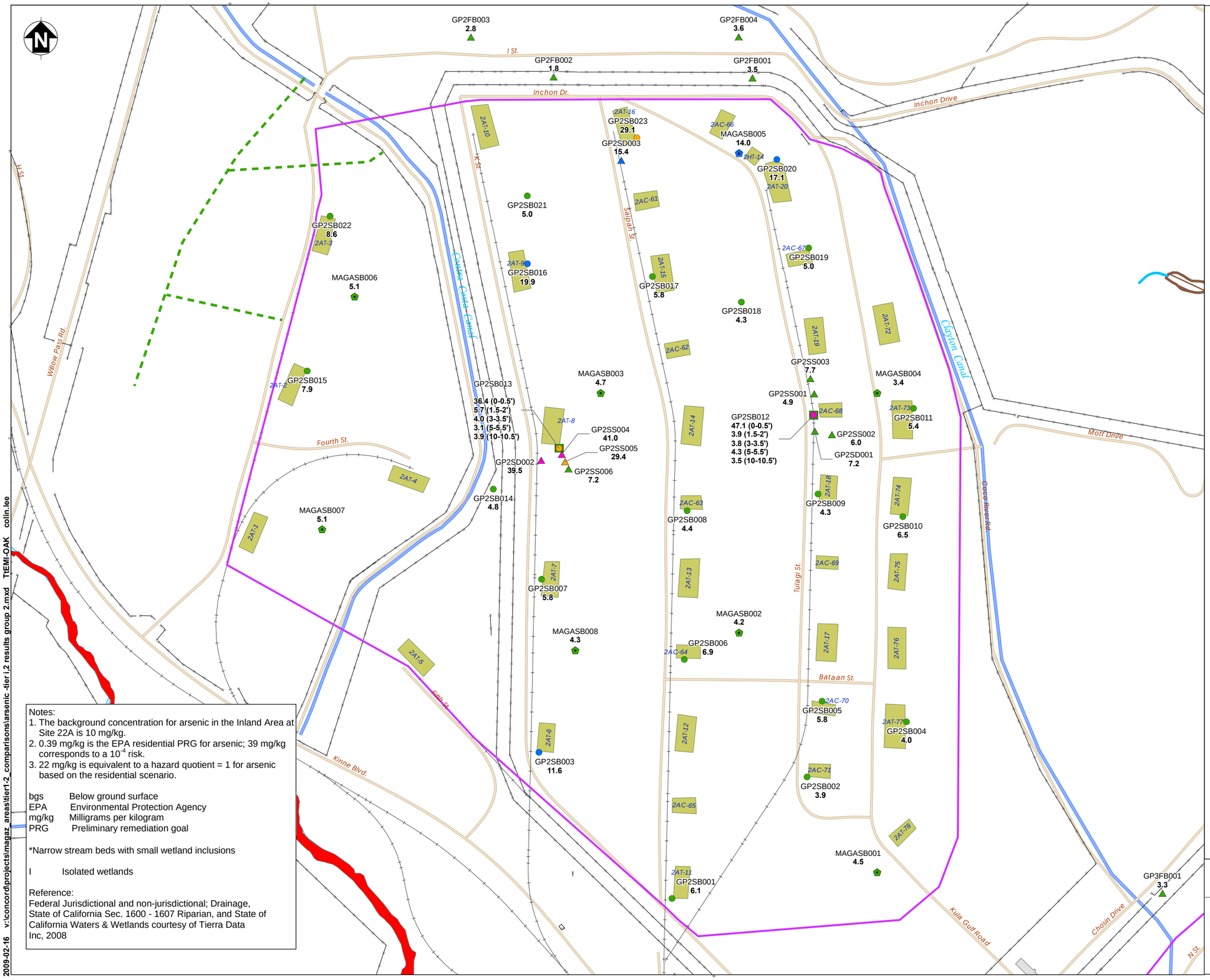
FORMER NAVWPNSTA SEAL BEACH DET CONCORD

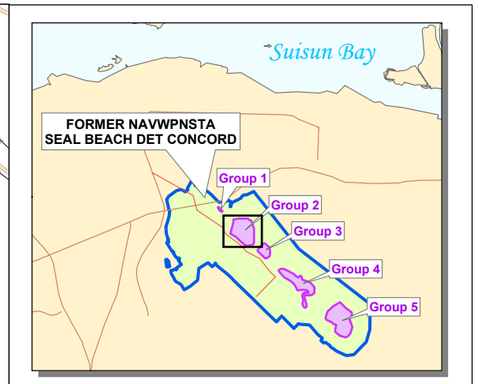
FIGURE 4-1
ARSENIC CONCENTRATIONS IN SURFACE SOIL AT GROUP 1 MAGAZINE AREA

Remedial Investigation Report for Site 22A

2009-02-04 v:\concord\projects\magaz_areas\2006wp\group_1.mxd TtEMI-OAK colin.lee

TTEM-0055-FZN1-0006





2005 Sampling Location (0-0.5 ft bgs)

2007 Tier I Sampling Location (0-0.5 ft bgs)

2008 Tier II Sampling Location (0-0.5 ft bgs)

2008 Tier II Soil Boring Location

Ammunition Magazine

Group 2 Magazine Area Boundary

Former NAVWPNSTA Seal Beach Det Concord Boundary

Federal

Jurisdictional Waters w/Wetlands*

Non-Jurisdictional Waters (I)

State

Sec. 1600-1607 California Fish & Game Code

Building

Drainage

Street

Railroad

Fence Line

GP2SB004 4.8 — Sampling Station ID; Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP2SB012 3.9 (1.5-2') — Sampling Station ID; Arsenic Concentration in mg/kg; Sample Depth in feet bgs

Result Less than or Equal to 10 mg/kg

Greater than 10 mg/kg and Less than or Equal to 22 mg/kg

Greater than 22 mg/kg and Less than or Equal to 39 mg/kg

Greater than 39 mg/kg

350 0 350
Feet

TETRA TECH EM INC.

Notes:
1. The background concentration for arsenic in the Inland Area at Site 22A is 10 mg/kg.
2. 0.39 mg/kg is the EPA residential PRG for arsenic; 39 mg/kg corresponds to a 10^{-4} risk.
3. 22 mg/kg is equivalent to a hazard quotient = 1 for arsenic based on the residential scenario.

bgs Below ground surface
EPA Environmental Protection Agency
mg/kg Milligrams per kilogram
PRG Preliminary remediation goal

*Narrow stream beds with small wetland inclusions

I Isolated wetlands

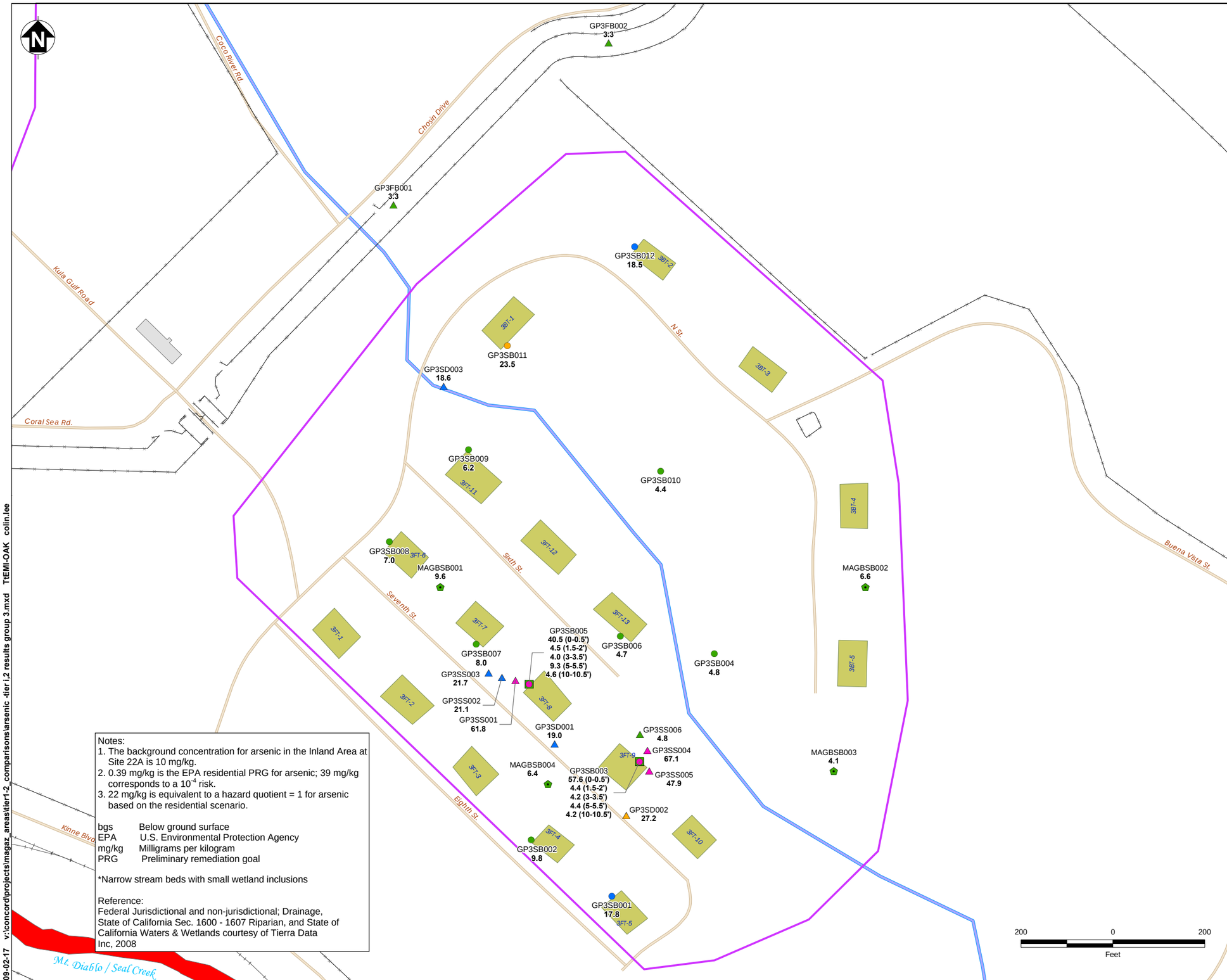
Reference:
Federal Jurisdictional and non-jurisdictional; Drainage, State of California Sec. 1600 - 1607 Riparian, and State of California Waters & Wetlands courtesy of Tierra Data Inc, 2008

FORMER NAVWPNSTA SEAL BEACH DET CONCORD

FIGURE 4-2
ARSENIC CONCENTRATIONS IN SURFACE AND SUBSURFACE SOIL AT GROUP 2 MAGAZINE AREA
Remedial Investigation Report for Site 22A

2009-02-16 v:\concord\projects\magaz_areas\tier1-2_comparisons\arsenic -tier i,2 results group 2.mxd TtEMI-OAK colin.lee

TTEM-0055-FZN1-0006

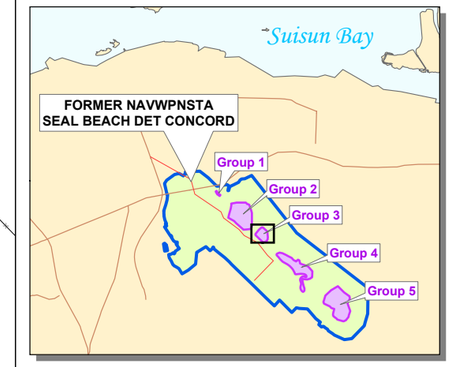


Notes:
1. The background concentration for arsenic in the Inland Area at Site 22A is 10 mg/kg.
2. 0.39 mg/kg is the EPA residential PRG for arsenic; 39 mg/kg corresponds to a 10^{-4} risk.
3. 22 mg/kg is equivalent to a hazard quotient = 1 for arsenic based on the residential scenario.

bgs Below ground surface
EPA U.S. Environmental Protection Agency
mg/kg Milligrams per kilogram
PRG Preliminary remediation goal

*Narrow stream beds with small wetland inclusions

Reference:
Federal Jurisdictional and non-jurisdictional; Drainage, State of California Sec. 1600 - 1607 Riparian, and State of California Waters & Wetlands courtesy of Tierra Data Inc, 2008



2005 Sampling Location (0-0.5 ft bgs)
2007 Tier I Sampling Location (0-0.5 ft bgs)
2008 Tier II Sampling Location (0-0.5 ft bgs)
2008 Tier II Soil Boring Location

Ammunition Magazine
Group 3 Magazine Area Boundary
Former NAVWPNSTA Seal Beach Det Concord Boundary

Federal
Jurisdictional Waters w/Wetlands*

State
Sec. 1600-1607, California Fish & Game Code
Building
Street
Railroad
Fence Line

GP3SB004 — Sampling Station ID
4.8 — Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP3SB005 — Sampling Station ID
4,5 (1.5-2') — Arsenic Concentration in mg/kg; Sample Depth in feet bgs

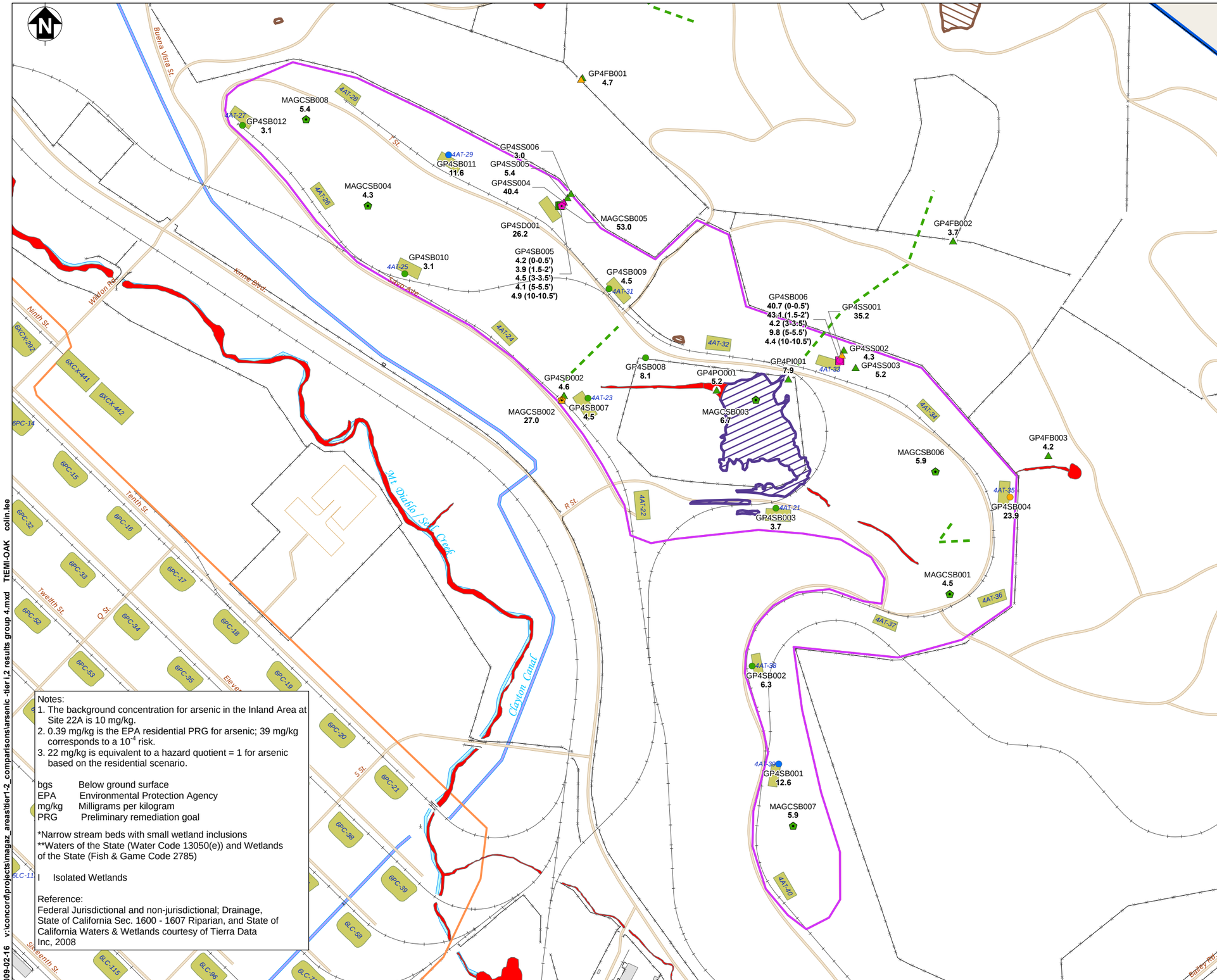
Result Less than or Equal to 10 mg/kg
Greater than 10 mg/kg and Less than or Equal to 22 mg/kg
Greater than 22 mg/kg and Less than or Equal to 39 mg/kg
Greater than 39mg/kg

TETRA TECH EM INC.

FORMER NAVWPNSTA SEAL BEACH DET CONCORD

FIGURE 4-3
ARSENIC CONCENTRATIONS IN SURFACE AND SUBSURFACE SOIL AT GROUP 3 MAGAZINE AREA
Remedial Investigation Report for Site 22A

2009-02-17 v:\concord\projects\magaz_areas\tier1-2_comparisons\arsenic -tier i,2 results group 3.mxd TtEMI-OAK colin.lee



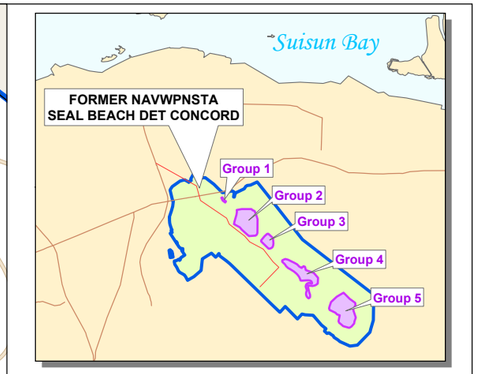
Notes:
1. The background concentration for arsenic in the Inland Area at Site 22A is 10 mg/kg.
2. 0.39 mg/kg is the EPA residential PRG for arsenic; 39 mg/kg corresponds to a 10^{-4} risk.
3. 22 mg/kg is equivalent to a hazard quotient = 1 for arsenic based on the residential scenario.

bgs Below ground surface
EPA Environmental Protection Agency
mg/kg Milligrams per kilogram
PRG Preliminary remediation goal

*Narrow stream beds with small wetland inclusions
**Waters of the State (Water Code 13050(e)) and Wetlands of the State (Fish & Game Code 2785)

I Isolated Wetlands

Reference:
Federal Jurisdictional and non-jurisdictional; Drainage, State of California Sec. 1600 - 1607 Riparian, and State of California Waters & Wetlands courtesy of Tierra Data Inc, 2008



2005 Sampling Location (0-0.5 ft bgs)
2007 Tier I Sampling Location (0-0.5 ft bgs)
2008 Tier II Sampling Location (0-0.5 ft bgs)
2008 Tier II Soil Boring Location

Ammunition Magazine
Group 4 Magazine Area Boundary
Site 22 Boundary
Former NAVWPNSTA Seal Beach Det Concord Boundary

Federal

Jurisdictional Waters w/Wetlands*
Jurisdictional Wetlands
Non-Jurisdictional Waters (I)

State

Sec. 1600-1607, California Fish & Game Code
State Waters & Wetlands**
Building
Drainage
Street
Railroad
Fence Line

GP4SB004 ← Sampling Station ID
4.8
Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP4SB005 ← Sampling Station ID
3.9 (1.5-2')
Sample Depth in feet bgs
Arsenic Concentration in mg/kg

Result Less than or Equal to 10 mg/kg
Greater than 10 mg/kg and Less than or Equal to 22 mg/kg
Greater than 22 mg/kg and Less than or Equal to 39 mg/kg
Greater than 39mg/kg

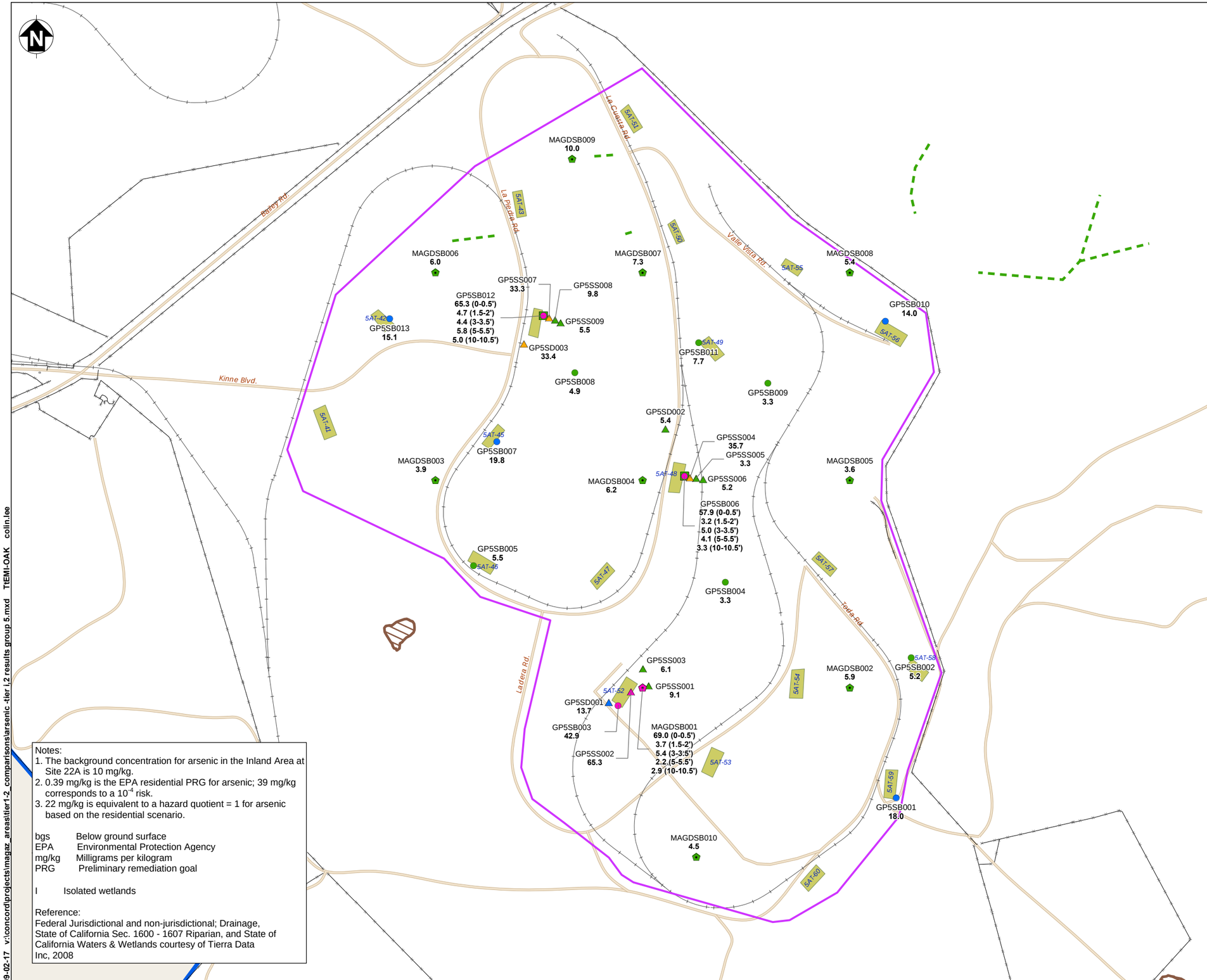
TETRA TECH EM INC.

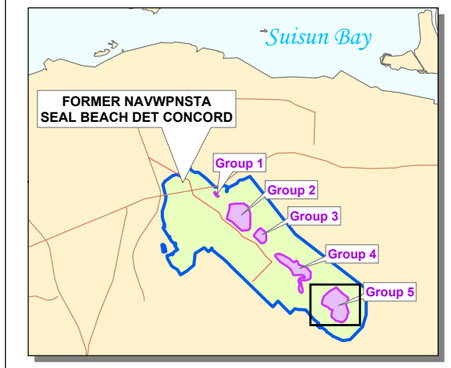
FORMER NAVWPNSTA SEAL BEACH DET CONCORD

FIGURE 4-4
ARSENIC CONCENTRATIONS IN SURFACE AND SUBSURFACE SOIL AT GROUP 4 MAGAZINE AREA
Remedial Investigation Report for Site 22A

2009-02-16 v:\concord\projects\magaz_areas\tier1-2_comparisons\arsenic -tier i,2 results group 4.mxd TtEMI-OAK colin.lee

TTEM-0055-FZN1-0006





2005 Sampling Location (0-0.5 ft bgs)

2007 Tier I Sampling Location (0-0.5 ft bgs)

2008 Tier II Sampling Location (0-0.5 ft bgs)

2008 Tier II Soil Boring Location

Ammunition Magazine

Group 5 Magazine Area Boundary

Former NAVWPNSTA Seal Beach Det Concord Boundary

Non-Jurisdictional Waters (I)

Building

Drainage

Street

Railroad

Fence Line

GP5SB004 — Sampling Station ID
4.8 — Arsenic Concentration in mg/kg in soil from 0 to 0.5 feet bgs

GP5SB012 — Sampling Station ID
4.7 (1.5-2') — Arsenic Concentration in mg/kg; Sample Depth in feet bgs

Result Less than or Equal to 10 mg/kg

Greater than 10 mg/kg and Less than or Equal to 22 mg/kg

Greater than 22 mg/kg and Less than or Equal to 39 mg/kg

Greater than 39mg/kg

450 0 450
Feet

TETRA TECH EM INC.

Notes:
1. The background concentration for arsenic in the Inland Area at Site 22A is 10 mg/kg.
2. 0.39 mg/kg is the EPA residential PRG for arsenic; 39 mg/kg corresponds to a 10^{-4} risk.
3. 22 mg/kg is equivalent to a hazard quotient = 1 for arsenic based on the residential scenario.

bgs Below ground surface
EPA Environmental Protection Agency
mg/kg Milligrams per kilogram
PRG Preliminary remediation goal

I Isolated wetlands

Reference:
Federal Jurisdictional and non-jurisdictional; Drainage, State of California Sec. 1600 - 1607 Riparian, and State of California Waters & Wetlands courtesy of Tierra Data Inc, 2008

FORMER NAVWPNSTA SEAL BEACH DET CONCORD

FIGURE 4-5
ARSENIC CONCENTRATIONS IN SURFACE AND SUBSURFACE SOIL AT GROUP 5 MAGAZINE AREA

Remedial Investigation Report for Site 22A

2009-02-17 v:\concord\projects\magaz_areas\tier1-2_comparisons\arsenic -tier i,2 results group 5.mxd TtEMI-OAK colin.lee

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
7	BHHRA	Section 2.3	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 5.0 through 5.6.5. Tetra Tech. June 1, 2009.

5.0 HUMAN HEALTH RISK ASSESSMENT

This section provides an overview of the methods used in the human health risk assessment (HHRA) and summarizes the results of the HHRA. A detailed discussion of the HHRA methods and results is provided in Appendix G. Risks to human health were assessed separately for each of the five magazine areas (Groups 1 through 5) at Site 22A.

The specific objectives of the HHRA were to: (1) estimate the magnitude of potential risk to human health associated with current site conditions and potential future land use scenarios, (2) identify the environmental media and chemicals that pose the primary human health concerns, (3) identify the environmental media and chemicals that pose little or no threat to human health, and (4) provide a foundation for assessing the need for further response actions.

The HHRA for Site 22A consisted of the following five basic steps:

- **Conceptual Site Model:** This step involves identifying potential human receptors and potential pathways for receptor exposure at the site.
- **Data Evaluation and Identification of chemicals of potential concern (COPC):** This step consists of evaluating site data and identifying COPC in media sampled.
- **Exposure Assessment:** This step involves quantifying receptor intake of COPCs for exposure pathways identified as potentially complete.
- **Toxicity Assessment:** This step consists of compiling toxicity values that characterize potential adverse health effects from exposure to COPCs.
- **Risk Characterization:** This step quantitatively characterizes potential risks to human health associated with exposure to COPCs. Risks were characterized separately for each magazine area.

These steps of the HHRA are described below in Sections 5.1 through 5.5. Results of the HHRA are summarized in Section 5.6.

5.1 CONCEPTUAL SITE MODEL

The first step involved identifying sources of chemicals at each site, affected environmental media, chemicals release and transport mechanisms that may occur at the site, human receptor populations that may be exposed to the affected media under current or future site conditions, and potential exposure pathways for each receptor population. This information was summarized in a conceptual site model (CSM). Figure 5-1 presents the CSMs for Site 22A.

As shown in the CSM, arsenic-containing herbicides are the sole source of site chemicals at Site 22A; arsenic is the sole COPC for Site 22A (Tetra Tech 2007c). Four receptors were identified for evaluation in the HHRA:

- Current rancher
- Future industrial worker
- Future construction worker
- Future resident (adult and child)

Health risks from exposure to arsenic were evaluated for each of these receptors for each of the five magazine areas. An unrestricted (residential) land-use scenario generally represents the greatest potential for exposure to site chemicals. Although the residential scenario is unlikely for Site 22A, it is evaluated to provide additional information to support risk management decisions for the site.

Potentially complete exposure pathways for each of these receptors are shown in the CSM (see Figure 5-1); cancer risks and noncancer hazards were quantified in the HHRA for each exposure pathway identified as potentially complete. Three exposure pathways for soil were identified as potentially complete for each receptor: (1) incidental soil ingestion, (2) dermal contact with soil, and (3) inhalation of arsenic adsorbed to windblown soil and released to outdoor air. Investigation of arsenic in groundwater was not required for this RI because concentrations of arsenic in soil that exceed background levels do not extend to the water table and groundwater is not considered to be affected by site sources of arsenic.

Exposure to surface soil (0 to 0.5 foot bgs) from direct contact was evaluated for both the current rancher and all future receptors and assumes that current site conditions are maintained or that any future use of the site is associated with minimal disturbance of site soils. Exposure to subsurface soil (0.5 to 10 feet bgs) and combined surface and subsurface soil (0 to 10 feet bgs) was also evaluated for all future receptors. Exposure to combined surface and subsurface soil assumes that future use of the site involves intrusive development and excavation of site soil, thereby mixing soils throughout the soil column and making deeper soils available at the surface for contact. Exposure to subsurface soil from 0.5 to 10 feet bgs was also evaluated under the same premise, but assumes that surface soil (0 to 0.5 foot bgs) at the site — where arsenic-containing herbicides were historically applied — is excavated before the site is developed.

5.2 DATA EVALUATION AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

This step consisted of evaluating the analytical data for usability in the HHRA, grouping the analytical data for soil by magazine area and soil depth interval. As discussed in Section 5.1, arsenic in soil is the sole COPC for Site 22A.

5.3 EXPOSURE ASSESSMENT

This step quantified exposure to arsenic for exposure pathways that are potentially complete. Exposure point concentrations (EPC) were estimated from measured or modeled concentrations, and pathway-specific intakes for arsenic were estimated for the identified receptors. A 95 percent upper confidence limit (95UCL) was used as the EPC for arsenic for each magazine area and soil depth interval.

5.4 TOXICITY ASSESSMENT

This step consisted of compiling the slope factors (SF) and reference doses (RfD) used to evaluate cancer risks and noncancer health effects from exposure to arsenic, which is associated with carcinogenic and noncarcinogenic effects. An SF is an upper-bound estimate on the increased cancer risk from lifetime exposure to a chemical. An RfD is an estimate of a daily exposure level that is likely to be without an appreciable risk of harmful effects. Based on the methodology for the HHRA, two sets of toxicity criteria were compiled: one set using federal (EPA) toxicity criteria, and another set using state of California (DTSC) toxicity criteria.

5.5 RISK CHARACTERIZATION

This step of the HHRA combined the results of the previous steps to quantitatively characterize potential risks to human health associated with exposure to arsenic at each of the five magazine areas. Cancer risks and noncancer health hazards for arsenic were characterized separately. This section summarizes the process for estimating cancer risks and HIs and describes the approach used to calculate total, background, and incremental risks for arsenic.

5.5.1 Characterization of Cancer Risks

The cancer risk associated with exposure to arsenic is estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure. The estimated risk is expressed as a unitless probability.

Two steps were used to estimate the cancer risk associated with exposure to arsenic. First, the pathway-specific intake was multiplied by the pathway-specific SF for arsenic to derive a pathway-specific cancer risk. Second, pathway-specific risks for arsenic were summed to estimate the total cancer risk for arsenic. Risks for arsenic were estimated separately for each receptor. The estimated cancer risk for the future residential exposure scenario was based on the sum of the risks estimated for child and adult residents.

EPA guidance on exposure levels considered protective of human health are used to aid in interpreting the results of the risk assessment. EPA defined general remedial action goals for sites on the National Priorities List in the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations Section 300.430). The goals

include a range for residual cancer risk, which is "an excess upper-bound lifetime cancer risk to an individual of between 1E-04 and 1E-06," or 1 in 10,000 to 1 in 1,000,000. The range between 1E-04 and 1E-06 is referred to as the "risk management range" in the HHRA. The lower end of the range, 1E-06, is referred to as the "point of departure" in the HHRA.

5.5.2 Characterization of Noncancer Hazards

The potential for exposure to arsenic to result in adverse health effects other than cancer was evaluated by comparing the pathway-specific intake for arsenic with the pathway-specific RfD for arsenic to derive a pathway-specific HQ. Then, the HQs for all exposure pathways were summed, yielding a hazard index (HI) for arsenic. Noncancer HIs for arsenic were estimated separately for each receptor. The estimated noncancer HI for the future residential exposure scenario was based on the total HI estimated for the child resident.

5.5.3 Total, Background, and Incremental Risks

Total, background, and incremental risks were calculated for each magazine area:

- Total risks were based on exposure to arsenic at the site, regardless of background concentrations. The purpose of the total risk evaluation is to provide information on health risks associated with exposure to arsenic at the site, regardless of whether concentrations of arsenic are attributable to site-related arsenic (that is, historical releases of arsenic) or naturally occurring (background) conditions. Attachment G1 of Appendix G contains the calculations for total risks.

- Background risks were calculated for arsenic in soil at naturally occurring concentrations. The purpose of the background risk evaluation is to provide information on health risks associated with exposure to naturally occurring arsenic at the site (that is, concentrations of arsenic that are not associated with site-related activities). Attachment G2 of Appendix G contains the calculations for background risks.

- Incremental risks were calculated for arsenic by excluding from the total risks for arsenic the proportion attributable to background concentrations of arsenic (that is, the background risk for arsenic). The purpose of the incremental risk evaluation is provide information on health risks associated with site-related arsenic, exclusive of naturally occurring arsenic (that is, the increment of risk for arsenic above the background risk for arsenic). Attachment G3 of Appendix G contains the calculations for incremental risks.

Potential cancer risks and noncancer HIs, a measure of the potential for adverse health effects other than cancer, were calculated for the total, background, and incremental risk evaluations for arsenic. In addition, two sets of risks (cancer risks and HIs) were calculated for each of these evaluations: one set using EPA toxicity criteria, and another set using state of California toxicity criteria.

5.6 RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT

This section summarizes the results of the HHRA. The summary of results is limited to the incremental risk evaluation for arsenic; that is, the risks for arsenic that are attributable to site-related activities. Incremental risk results based on both federal and State of California toxicity criteria are discussed. Cancer risks calculated using State of California toxicity criteria for arsenic are higher than risks calculated using federal toxicity criteria by approximately a factor of 6.2 for the rancher, industrial worker, and residential receptors, and by a factor of 4.5 for the construction worker.

In the discussion below, "point of departure" refers to a cancer risk of 1E-06 and "risk management range" refers to the range of risks between 1E-04 and 1E-06 (see Section 5.5.1). "Threshold HI" refers to a noncancer HI of 1.0 (see Section 5.5.2). Tables 5-1 through 5-4 provide an overall summary of the cancer risk and noncancer HI results.

5.6.1 Group 1 Magazine Area

Incremental cancer risks and noncancer HIs were not calculated for the Group 1 Magazine Area because site concentrations for arsenic did not exceed background concentrations for any of the three soil depth intervals evaluated for this area. Therefore, no site-related health risks are associated with exposure to arsenic in soil at the Group 1 Magazine Area. Health risks for exposure to arsenic in this area are associated with naturally occurring background concentrations of arsenic.

5.6.2 Group 2 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 2 Magazine Area are summarized in Table 5-1.

Assessment of incremental risks for the Group 2 Magazine Area was limited to surface soil (0 to 0.5 foot bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil and combined surface and subsurface soil are associated with naturally occurring background concentrations of arsenic.

<u>Federal Toxicity Criteria</u>

The cancer risks for the current rancher (7E-07 – surface soil) and future construction worker (4E-07 – surface soil) are less than the point of departure of 1E-06. The cancer risks for the future industrial worker (6E-06 – surface soil) and future resident (2E-05 – surface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors are within the risk management range. Cancer risks range from 2E-06 for the future construction worker to 1E-04 for the future resident.

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

5.6.3 Group 3 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 3 Magazine Area are summarized in Table 5-2.

Assessment of incremental risks for the Group 3 Magazine Area was limited to surface soil (0 to 0.5 foot bgs) and combined surface and subsurface soil (0 to 10 feet bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil are associated with naturally occurring background concentrations of arsenic.

Federal Toxicity Criteria

The cancer risks for the current rancher (1E-06 – surface soil) and future construction worker (8E-07 – surface soil; 1E-06 – combined surface and subsurface soil) do not exceed the point of departure of 1E-06. The cancer risks for the future industrial worker (1E-05 – surface soil; 1E-05 – combined surface and subsurface soil) and future resident (4E-05 – surface soil; 5E-05 combined surface and subsurface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors are within the risk management range. Cancer risks range from 4E-06 for the future construction worker to 3E-04 for the future resident, which slightly exceeds the upper end of the risk management range.

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

5.6.4 Group 4 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 4 Magazine Area are summarized in Table 5-3.

Assessment of incremental risks for the Group 4 Magazine Area was limited to surface soil (0 to 0.5 foot bgs) and combined surface and subsurface soil (0 to 10 feet bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil are associated with naturally occurring background concentrations of arsenic (see Attachment G2 of Appendix G for background risk results).

Federal Toxicity Criteria

The cancer risks for the current rancher (9E-07 – surface soil) and future construction worker (6E-07 – surface soil; 6E-07 – combined surface and subsurface soil) do not exceed the point of departure of 1E-06. The cancer risks for the future industrial worker (8E-06 – surface soil; 8E-06 – combined surface and subsurface soil) and future resident (3E-05 – surface soil; 3E-05 combined surface and subsurface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors except the future resident are within the risk management range. Cancer risks range for nonresidential receptors range from 3E-06 for the future construction worker to 5E-05 for the future industrial worker. Cancer risks for the future resident slightly exceed the upper end of the risk management range (2E-04 – surface soil; 2E-04 combined surface and subsurface soil).

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

5.6.5 Group 5 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 5 Magazine Area are summarized in Table 5-4.

Assessment of incremental risks for the Group 5 Magazine Area was limited to surface soil (0 to 0.5 foot bgs) and combined surface and subsurface soil (0 to 10 feet bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not

calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil are associated with naturally occurring background concentrations of arsenic (see Attachment G2 of Appendix G for background risk results).

Federal Toxicity Criteria

The cancer risks for the future construction worker (1E-06 – surface soil; 9E-07 – combined surface and subsurface soil) do not exceed the point of departure of 1E-06. The cancer risks for the current rancher (2E-06 – surface soil), future industrial worker (2E-05 – surface soil; 1E-05 – combined surface and subsurface soil) and future resident (6E-05 – surface soil; 4E-05 combined surface and subsurface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors except the future resident are within the risk management range. Cancer risks range for nonresidential receptors range from 4E-06 for the future construction worker to 1E-04 for the future industrial worker. Cancer risks for the future resident slightly exceed the upper end of the risk management range (4E-04 – surface soil; 3E-04 combined surface and subsurface soil).

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
8	screening-level ecological risk assessment (SLERA)	Section 2.3	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 6.0 through 6.3. Tetra Tech. June 1, 2009.

6.0 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A RISK REFINEMENT

A SLERA was conducted for arsenic only at Site 22A following the Tier 1 approach presented in Navy guidance for conducting ecological risk assessments (Navy 1999, 2006a). The SLERA used conservative assumptions and available scientific literature to evaluate potential risk to ecological receptors in an approach consistent with Steps 1 and 2 of the eight-step process described in guidance from the EPA (1997). According to Navy guidance, an intermediate refinement step may be conducted (Step 3a) if the SLERA indicates unacceptable or uncertain risk. This section summarizes the approach, results, and conclusions of the SLERA and Step 3a risk refinement. Appendix H provides the complete SLERA and Step 3a risk refinement for Site 22A.

6.1 ECOLOGICAL RISK ASSESSMENT FRAMEWORK

The SLERA has four primary phases: (1) problem formulation, (2) exposure estimates, (3) ecological effects evaluation, and (4) risk characterization. During the problem formulation phase, an ecological conceptual site model is developed for exposure at the site and selection of assessment and measurement endpoints. During the exposure estimate phase, exposure parameters are established for representative receptors identified in the problem formulation phase. During the ecological effects evaluation, contaminant exposure levels that represent conservative thresholds for adverse ecological effects are identified. Finally, during the risk characterization phase, the potential risks to selected assessment endpoints associated with the site are conservatively estimated.

Data for soil (0.0 to 3.0 feet bgs and 0.0 to 6.0 feet bgs) collected from Site 22A were used to support the SLERA. Five data sets were used in this evaluation: one from each of the five groups of magazine areas. The arsenic concentrations from each of the five magazine areas will be evaluated separately.

Eight assessment endpoints, ranging from plants to higher-trophic-level receptors, were identified for specific evaluation, as follows:

- Protection and maintenance of terrestrial plants
- Protection and maintenance of soil invertebrates
- Protection of insectivorous amphibians typical to the area
- Protection of omnivorous birds typical to the area
- Protection of carnivorous birds typical to the area
- Protection of large and small herbivorous mammals typical to the area
- Protection of omnivorous mammals typical to the area
- Protection of carnivorous mammals typical to the area

The following measurement endpoints were used in evaluating potential ecological impacts on the assessment endpoints identified for Site 22A:

- For terrestrial plants, comparison of the concentrations of arsenic in soil with Eco-SSL.
- For terrestrial invertebrates, comparison of concentrations of arsenic in soil with ORNL toxicity benchmarks for invertebrates.
- For amphibians, risk is evaluated qualitatively. Very little information on toxicity is available to assess risk from arsenic to amphibians.
- For birds and mammals, reproductive or physiological impacts were evaluated using the HQ approach, by comparing modeled doses to literature-derived high and low toxicity reference values (TRV). A dose that exceeded the low TRV indicated potential risk, while a dose that exceeded the high TRV indicated a potential significant risk.

6.2 RESULTS OF THE SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (STEP 2)

This section describes the risk from arsenic to plant, invertebrates, mammals, and birds under Step 2 of the SLERA process.

6.2.1 Risk to Plants

The conceptual site model described in Appendix H identifies a complete exposure pathway from soils to plants via direct contact. As a result, risk to plants was evaluated. Arsenic was found to pose potential risk to plants. Hazard quotients for plants are presented below.

Arsenic Hazard Quotients for Plants	
Magazine Group	**Hazard Quotient**
Group 1	0.38
Group 2	**2.62**
Group 3	**3.73**
Group 4	**2.94**
Group 5	**3.83**

Bold values indicate a hazard quotient greater than 1.

6.2.2 Risk to Invertebrates

The conceptual site model described in Appendix H identifies a complete exposure pathway from soils to invertebrates via direct contact. Ingestion of soil by terrestrial invertebrates is included in the direct contact pathway. As a result, risk to invertebrates was evaluated. Arsenic was found to

pose potential risk to terrestrial invertebrates. Hazard quotients for invertebrates are presented below.

Arsenic Hazard Quotients for Invertebrates		
Magazine Group	**Hazard Quotient for Earthworms**	**Hazard Quotient for Microbial Processes**
Group 1	0.12	0.07
Group 2	0.79	0.47
Group 3	**1.12**	0.67
Group 4	0.88	0.53
Group 5	**1.15**	0.69

Bold values indicate a hazard quotient greater than 1.

6.2.3 Risk to Amphibians

The conceptual site model described in Appendix H identifies a direct exposure pathway from soils to amphibians via ingestion of soil. As a result, risk to amphibians was evaluated. There is also a potential exposure pathway via ingestion of water during the wet season when water is present in the drainage ditches and other depressions. Although the general body of information on environmental contamination and effects to amphibians is growing, relatively little information on amphibians is available when compared with better-studied species of mammals, birds, fish, benthic invertebrates, and plankton. No soil screening benchmarks for amphibians have been developed because of the limited published data on this topic. Most studies of amphibian toxicity are based on exposure to water or sediment.

Based on a review of the literature, it was concluded that there is high uncertainty in specifying threshold levels for arsenic, its mechanism of action, and the nature of the effects that would result from exposure to the concentrations in soil at Site 22A. Therefore, conclusions about the overall level of risk to amphibians are tentative at best. Any response actions taken at Site 22A should be based on more comprehensive estimates of risk for higher-trophic-level organisms, and it is assumed that actions based on these criteria will generally be protective of amphibians as well.

6.2.4 Risk to Birds

The evaluation of risk to birds focused on selected assessment endpoints identified in Section 6.1. Risks to representative birds (American robin and red-tailed hawk) at Site 22A were evaluated using a food-chain model, based on an HQ approach. Estimated daily doses of arsenic for each bird were compared with low and high TRVs by calculating an HQ. Calculations are presented in their entirety in Appendix H.

HQs for each magazine group for the American robin are presented in the table below. Arsenic does not pose potential risk to the American robin at Site 22A.

Arsenic Hazard Quotients for the American Robin		
Magazine Group	**Dose/High TRV**	**Dose/Low TRV**
Group 1	0.02	0.08
Group 2	0.11	0.43
Group 3	0.15	0.60
Group 4	0.12	0.48
Group 5	0.15	0.61

HQs for each magazine group for the red-tailed hawk are presented in the table below. Arsenic does not pose potential risk to the red-tailed hawk at Site 22A.

Arsenic Hazard Quotients for the Red-tailed Hawk		
Magazine Group	**Dose/High TRV**	**Dose/Low TRV**
Group 1	0.002	0.01
Group 2	0.01	0.05
Group 3	0.02	0.06
Group 4	0.01	0.05
Group 5	0.02	0.07

Concentrations of arsenic at Site 22A do not pose potential risk to omnivorous or carnivorous birds, as represented by the surrogate species American robin and red-tailed hawk.

6.2.5 Risk to Mammals

The evaluation of risk to mammals focused on selected assessment endpoints identified in Section 6.1. Risks to representative mammals (California ground squirrel, Western harvest mouse, black-tailed deer, and grey fox) at Site 22A were evaluated using a food-chain model, based on an HQ approach. Estimated daily doses of arsenic for each mammal were compared with low and high TRVs by calculating an HQ. Calculations are presented in their entirety in Appendix H.

HQs for each magazine group for the western harvest mouse are presented in the table below. Arsenic poses potential risk to the western harvest mouse at Groups 2 through 5 Magazine Areas at Site 22A.

Arsenic Hazard Quotients for the Western Harvest Mouse		
Magazine Group	**Dose/High TRV**	**Dose/Low TRV**
Group 1	0.03	0.40
Group 2	0.14	**1.92**
Group 3	0.19	**2.58**
Group 4	0.15	**2.12**
Group 5	0.19	**2.65**

Bold values indicate a hazard quotient greater than 1.

HQs for each magazine group for the California ground squirrel are presented in the table below. Arsenic poses potential risk to the California ground squirrel at Groups 3 and 5 Magazine Areas at Site 22A.

Arsenic Hazard Quotients for the California Ground Squirrel		
Magazine Group	**Dose/High TRV**	**Dose/Low TRV**
Group 1	0.01	0.11
Group 2	0.05	0.75
Group 3	0.08	**1.07**
Group 4	0.06	0.85
Group 5	0.08	**1.10**

Bold values indicate a hazard quotient greater than 1.

HQs for each magazine group for the black-tailed deer are presented in the table below. Arsenic does not pose potential risk to the black-tailed deer at Site 22A.

Arsenic Hazard Quotients for the Black-Tailed Deer		
Magazine Group	**Dose/High TRV**	**Dose/Low TRV**
Group 1	0.002	0.02
Group 2	0.01	0.17
Group 3	0.02	0.24
Group 4	0.01	0.19
Group 5	0.02	0.24

HQs for each magazine group for the grey fox are presented in the table below. Arsenic does not pose potential risk to the grey fox at Site 22A.

Arsenic Hazard Quotients for the Grey Fox		
Magazine Group	**Dose/High TRV**	**Dose/Low TRV**
Group 1	0.003	0.03
Group 2	0.02	0.22
Group 3	0.02	0.32
Group 4	0.02	0.25
Group 5	0.02	0.32

Concentrations of arsenic pose potential risks to small herbivorous mammals and small burrowing herbivorous mammals, as represented by the surrogate species western harvest mouse and California ground squirrel. Arsenic does not pose potential risk to large herbivorous mammals or carnivorous mammals, as represented by the surrogate species black-tailed deer and grey fox.

6.3 RESULTS OF THE RISK REFINEMENT (STEP 3A)

Many of the assumptions in the SLERA process are conservative and result in overestimates of site-specific parameters, which bias the estimates toward an overestimation of risk. Elements of the SLERA exposure model that resulted in an overestimate of risk included use of maximum arsenic concentrations to represent site conditions, the assumption of 100 percent bioavailability of arsenic to receptors, and the assumption that each receptor is feeding exclusively in the habitat area where they are modeled. Arsenic was identified as a risk driver in the SLERA (Step 2), and was reconsidered under Step 3a using less conservative assumptions for a number of parameters in the food chain modeling. Specific variables assessed included background concentrations of metals, spatial variations in the exposure point concentration, receptor site use, and available toxicological literature.

The 95 UCL concentrations of arsenic in soil for plants and invertebrates were compared with additional benchmark values for the refined assessment. Doses were recalculated for birds and mammals based on the 95 UCL concentration for soil and a more realistic site use factor. Refined doses of arsenic were then compared with the TRV to evaluate the risk to each representative receptor that showed potential risks in the SLERA. Revised site use factors were calculated by dividing the site acreage by the foraging range of the receptors to yield a more realistic prediction of the receptors' use of the sites and exposure to arsenic. However, the default value of 1.0 was used because the calculation yielded a site use factor greater than 1.0 in each magazine. HQs for each magazine group for the western harvest mouse and California ground squirrel are presented in the table below. Arsenic does not pose potential risk to the grey fox at Site 22A.

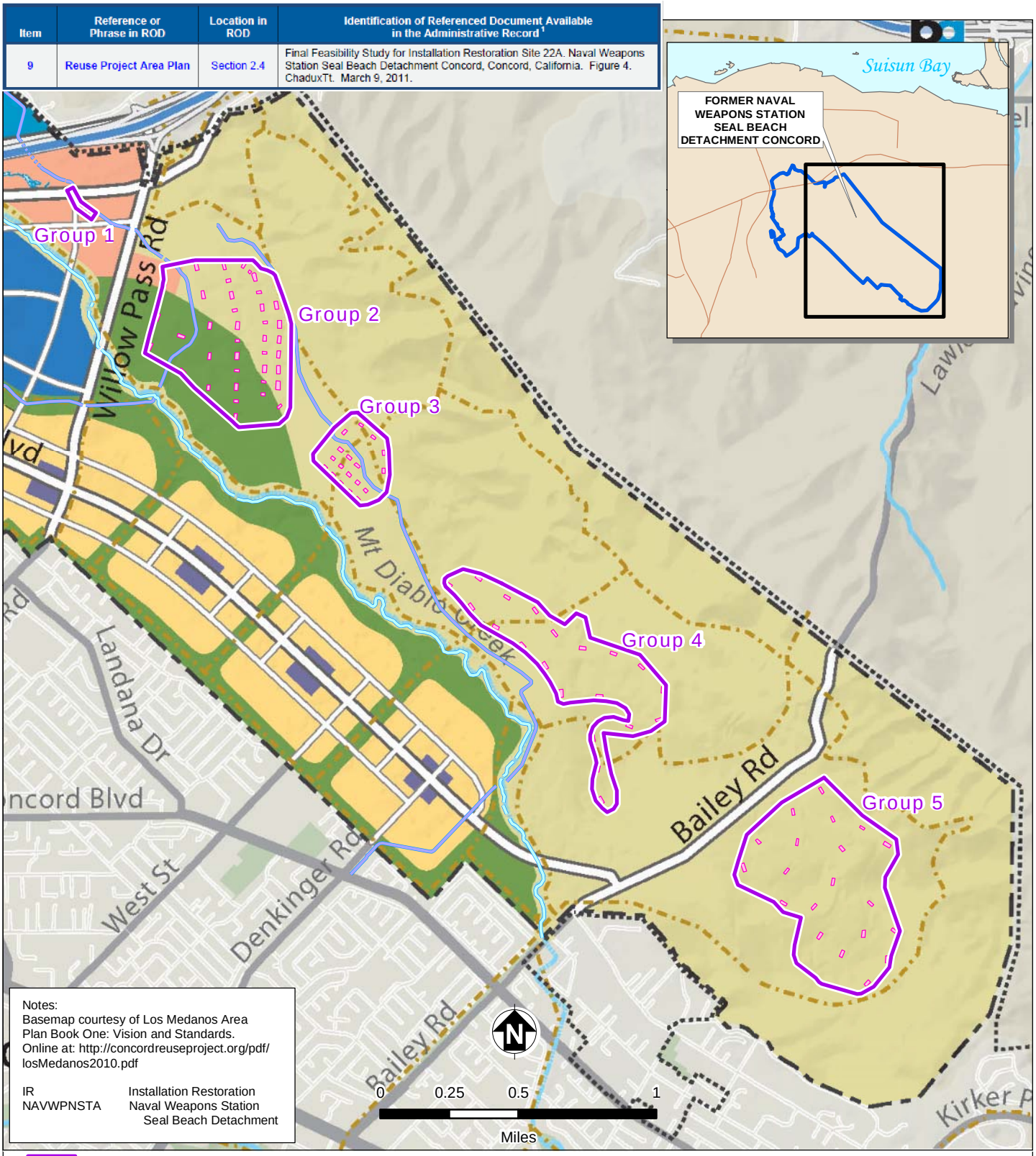
Magazine Group	Arsenic Hazard Quotients for the Western Harvest Mouse		Arsenic Hazard Quotients for the California Ground Squirrel	
	Dose/High TRV	Dose/Low TRV	Dose/High TRV	Dose/Low TRV
Group 2	0.05	0.67	NA	NA
Group 3	0.08	**1.14**	0.03	0.40
Group 4	0.06	0.83	NA	NA
Group 5	0.08	**1.04**	0.03	0.36

Bold values indicate a hazard quotient greater than 1.

NA Arsenic did pose potential risk based on Step 2 SLERA

Based on the results of Step 3a, arsenic in surface soil at Site 22A does not pose unacceptable risk to ecological receptors. The complete Step 3a risk refinement results are presented in Appendix H.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
9	Reuse Project Area Plan	Section 2.4	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Figure 4. ChaduxTt. March 9, 2011.



Notes:
Basemap courtesy of Los Medanos Area Plan Book One: Vision and Standards. Online at: http://concordreuseproject.org/pdf/losMedanos2010.pdf

IR — Installation Restoration
NAVWPNSTA — Naval Weapons Station Seal Beach Detachment

- Inland Area Magazines Groups 1 through 5 (IR Site 22A)
- Munition Magazine Within Magazine Group
- Village Center
- Village Neighborhood
- Campus
- First Responder Training Center
- Commercial Flex
- Conservation Open Space
- Greenways, Citywide Parks, and Tournament Facilities
- Recreation Trails
- Through Streets
- Collector Streets
- Planning Area Boundary
- City of Concord Boundary

ChaduxTt JV
Consulting Engineers and Scientists

FORMER NAVWPNSTA CONCORD

FIGURE 4
CITY OF CONCORD
REUSE AREAS
Feasibility Study for IR Site 22A

2011-03-08 v:\concord\projects\s22\concord_reuse_area.mxd TtEMI-OAK colin.lee

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
10	fate and transport	Section 2.5	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 7.0. Tetra Tech. June 1, 2009.

7.0 CONTAMINANT FATE AND TRANSPORT

The fate and transport of contaminants depends on the physical and chemical properties of the chemicals released; the nature of the release; and the physical, chemical, and biological characteristics of the environment into which the contaminants have been released. Arsenic is the only chemical of concern in soil that poses risk to human health or the environment.

Arsenic is a metalloid widely distributed in the earth's crust. It can exist in four valence states: -3, 0, +3, and +5. Elemental arsenic (0) and arsine (–3) can exist in strongly reducing environments. Under moderately reducing conditions, arsenite (+3) may be the dominant form, but arsenate (+5) is generally the stable oxidation state in oxygenated environments.

Sources of arsenic in the environment include natural sources (the parent rock material from which the soil was formed), industrial sources such as smelting, and the use of arsenical pesticides or herbicides. As discussed in Section 4.0, elevated concentrations of arsenic at Site 22A are attributed to application of an arsenic-containing herbicide to control vegetation at the magazines.

EPA banned use of most arsenic-containing pesticides and herbicides in the late 1980s. Inorganic arsenic such as lead arsenate and sodium arsenate were the dominant pesticides used by farmers and fruit growers from the mid-19th century to the mid-1940s. However, use of inorganic arsenic compounds in agriculture virtually disappeared beginning in the 1960s. Organic arsenicals, such as cacodylic acid, disodium methylarsenate, monosodium methylarsenate, and arsenic acid are still used as herbicides; most of these compounds are applied to cotton, citrus, and sod (ATSDR 2000).

Arsenate (+5), the oxidized form of arsenic, is the likely form of arsenic present at the site since the surface soil has been exposed to the air. Inorganic arsenic is relatively immobile in soil because it binds (or adsorbs) to soil particles. However, arsenic bound to soil particles may be transported by wind or in surface water runoff. In addition, microorganisms in soil may convert inorganic arsenic to organic forms and to arsine that is volatilized from soil to air. However, arsine is probably oxidized rapidly in the atmosphere (Callahan and others 1979) to nonvolatile forms that settle back to the ground.

Most arsenic in agricultural soils is immobile and tends to concentrate and remain in upper soil layers indefinitely (ATSDR 2000). Characteristics of the soil such as pH, organic matter content, clay content, and cation exchange capacity can affect the amount of arsenic adsorbed to soil particles. Clay materials have strong sorptive properties, and the substantial clay and silty clay content in soil at Site 22A has likely limited the mobility of arsenic in soil.

Arsenic is often associated with iron and manganese oxides in soil and may therefore be released when these oxides are reduced; reducing conditions in surface soils may be present during flooding. Only temporary flooding in drainage ditches after large storms occurs at Site 22A. An oxidation or reduction reaction results when a reacting chemical species (oxidizing agent)

accepts electrons from other substances and is thereby reduced, while the reactant (reducing agent) donates electrons to other substances and is oxidized. Changes in oxidation state result in changes in sorption, solubility, toxicity, and other chemical characteristics.

The rate of leaching of arsenic from soil to groundwater is related to the permeability of soil, which is greater in sandy or low clay soils than in soils with higher clay content, such as those at Site 22A. However, leaching usually does not transport arsenic to great depth because many arsenic compounds tend to partition to soil under oxidizing conditions (ATSDR 2000). Arsenic also may be transported on soil particles mobilized during fast stormwater flow in the drainage ditches.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
11	chemicals of potential concern (COPC)	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.2. Tetra Tech. June 1, 2009.

- Current rancher
- Future industrial worker
- Future construction worker
- Future resident (adult and child)

Health risks from exposure to arsenic were evaluated for each of these receptors for each of the five magazine areas. An unrestricted (residential) land-use scenario generally represents the greatest potential for exposure to site chemicals. Although the residential scenario is unlikely for Site 22A, it is evaluated to provide additional information to support risk management decisions for the site.

Potentially complete exposure pathways for each of these receptors are shown in the CSM (see Figure 5-1); cancer risks and noncancer hazards were quantified in the HHRA for each exposure pathway identified as potentially complete. Three exposure pathways for soil were identified as potentially complete for each receptor: (1) incidental soil ingestion, (2) dermal contact with soil, and (3) inhalation of arsenic adsorbed to windblown soil and released to outdoor air. Investigation of arsenic in groundwater was not required for this RI because concentrations of arsenic in soil that exceed background levels do not extend to the water table and groundwater is not considered to be affected by site sources of arsenic.

Exposure to surface soil (0 to 0.5 foot bgs) from direct contact was evaluated for both the current rancher and all future receptors and assumes that current site conditions are maintained or that any future use of the site is associated with minimal disturbance of site soils. Exposure to subsurface soil (0.5 to 10 feet bgs) and combined surface and subsurface soil (0 to 10 feet bgs) was also evaluated for all future receptors. Exposure to combined surface and subsurface soil assumes that future use of the site involves intrusive development and excavation of site soil, thereby mixing soils throughout the soil column and making deeper soils available at the surface for contact. Exposure to subsurface soil from 0.5 to 10 feet bgs was also evaluated under the same premise, but assumes that surface soil (0 to 0.5 foot bgs) at the site — where arsenic-containing herbicides were historically applied — is excavated before the site is developed.

5.2 DATA EVALUATION AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

This step consisted of evaluating the analytical data for usability in the HHRA, grouping the analytical data for soil by magazine area and soil depth interval. As discussed in Section 5.1, arsenic in soil is the sole COPC for Site 22A.

5.3 EXPOSURE ASSESSMENT

This step quantified exposure to arsenic for exposure pathways that are potentially complete. Exposure point concentrations (EPC) were estimated from measured or modeled concentrations, and pathway-specific intakes for arsenic were estimated for the identified receptors. A 95 percent upper confidence limit (95UCL) was used as the EPC for arsenic for each magazine area and soil depth interval.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
12	exposure assessment	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.3. Tetra Tech. June 1, 2009.

on the increased cancer risk from lifetime exposure to a chemical. An RfD is an estimate of a daily exposure level that is likely to be without an appreciable risk of harmful effects. Based on the methodology for the HHRA, two sets of toxicity criteria were compiled: one set using federal (EPA) toxicity criteria, and another set using state of California (DTSC) toxicity criteria.

5.5 RISK CHARACTERIZATION

This step of the HHRA combined the results of the previous steps to quantitatively characterize potential risks to human health associated with exposure to arsenic at each of the five magazine areas. Cancer risks and noncancer health hazards for arsenic were characterized separately. This section summarizes the process for estimating cancer risks and HIs and describes the approach used to calculate total, background, and incremental risks for arsenic.

5.5.1 Characterization of Cancer Risks

The cancer risk associated with exposure to arsenic is estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure. The estimated risk is expressed as a unitless probability.

Two steps were used to estimate the cancer risk associated with exposure to arsenic. First, the pathway-specific intake was multiplied by the pathway-specific SF for arsenic to derive a pathway-specific cancer risk. Second, pathway-specific risks for arsenic were summed to estimate the total cancer risk for arsenic. Risks for arsenic were estimated separately for each receptor. The estimated cancer risk for the future residential exposure scenario was based on the sum of the risks estimated for child and adult residents.

EPA guidance on exposure levels considered protective of human health are used to aid in interpreting the results of the risk assessment. EPA defined general remedial action goals for sites on the National Priorities List in the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations Section 300.430). The goals

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
13	toxicity assessment	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.4. Tetra Tech. June 1, 2009.

Exposure point concentrations (EPC) were estimated from measured or modeled concentrations, and pathway-specific intakes for arsenic were estimated for the identified receptors. A 95 percent upper confidence limit (95UCL) was used as the EPC for arsenic for each magazine area and soil depth interval.

5.4 TOXICITY ASSESSMENT

This step consisted of compiling the slope factors (SF) and reference doses (RfD) used to evaluate cancer risks and noncancer health effects from exposure to arsenic, which is associated with carcinogenic and noncarcinogenic effects. An SF is an upper-bound estimate on the increased cancer risk from lifetime exposure to a chemical. An RfD is an estimate of a daily exposure level that is likely to be without an appreciable risk of harmful effects. Based on the methodology for the HHRA, two sets of toxicity criteria were compiled: one set using federal (EPA) toxicity criteria, and another set using state of California (DTSC) toxicity criteria.

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Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
14	risk characterization	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Sections 5.5 through 5.6.5, and Tables 5-1 through 5-4. Tetra Tech. June 1, 2009.

each magazine area and soil depth interval.

5.4 TOXICITY ASSESSMENT

This step consisted of compiling the slope factors (SF) and reference doses (RfD) used to evaluate cancer risks and noncancer health effects from exposure to arsenic, which is associated with carcinogenic and noncarcinogenic effects. An SF is an upper-bound estimate on the increased cancer risk from lifetime exposure to a chemical. An RfD is an estimate of a daily exposure level that is likely to be without an appreciable risk of harmful effects. Based on the methodology for the HHRA, two sets of toxicity criteria were compiled: one set using federal (EPA) toxicity criteria, and another set using state of California (DTSC) toxicity criteria.

5.5 RISK CHARACTERIZATION

This step of the HHRA combined the results of the previous steps to quantitatively characterize potential risks to human health associated with exposure to arsenic at each of the five magazine areas. Cancer risks and noncancer health hazards for arsenic were characterized separately. This section summarizes the process for estimating cancer risks and HIs and describes the approach used to calculate total, background, and incremental risks for arsenic.

5.5.1 Characterization of Cancer Risks

The cancer risk associated with exposure to arsenic is estimated as the incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure. The estimated risk is expressed as a unitless probability.

Two steps were used to estimate the cancer risk associated with exposure to arsenic. First, the pathway-specific intake was multiplied by the pathway-specific SF for arsenic to derive a pathway-specific cancer risk. Second, pathway-specific risks for arsenic were summed to estimate the total cancer risk for arsenic. Risks for arsenic were estimated separately for each receptor. The estimated cancer risk for the future residential exposure scenario was based on the sum of the risks estimated for child and adult residents.

EPA guidance on exposure levels considered protective of human health are used to aid in interpreting the results of the risk assessment. EPA defined general remedial action goals for sites on the National Priorities List in the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations Section 300.430). The goals

include a range for residual cancer risk, which is "an excess upper-bound lifetime cancer risk to an individual of between 1E-04 and 1E-06," or 1 in 10,000 to 1 in 1,000,000. The range between 1E-04 and 1E-06 is referred to as the "risk management range" in the HHRA. The lower end of the range, 1E-06, is referred to as the "point of departure" in the HHRA.

5.5.2 Characterization of Noncancer Hazards

The potential for exposure to arsenic to result in adverse health effects other than cancer was evaluated by comparing the pathway-specific intake for arsenic with the pathway-specific RfD for arsenic to derive a pathway-specific HQ. Then, the HQs for all exposure pathways were summed, yielding a hazard index (HI) for arsenic. Noncancer HIs for arsenic were estimated separately for each receptor. The estimated noncancer HI for the future residential exposure scenario was based on the total HI estimated for the child resident.

5.5.3 Total, Background, and Incremental Risks

Total, background, and incremental risks were calculated for each magazine area:

- Total risks were based on exposure to arsenic at the site, regardless of background concentrations. The purpose of the total risk evaluation is to provide information on health risks associated with exposure to arsenic at the site, regardless of whether concentrations of arsenic are attributable to site-related arsenic (that is, historical releases of arsenic) or naturally occurring (background) conditions. Attachment G1 of Appendix G contains the calculations for total risks.

- Background risks were calculated for arsenic in soil at naturally occurring concentrations. The purpose of the background risk evaluation is to provide information on health risks associated with exposure to naturally occurring arsenic at the site (that is, concentrations of arsenic that are not associated with site-related activities). Attachment G2 of Appendix G contains the calculations for background risks.

- Incremental risks were calculated for arsenic by excluding from the total risks for arsenic the proportion attributable to background concentrations of arsenic (that is, the background risk for arsenic). The purpose of the incremental risk evaluation is provide information on health risks associated with site-related arsenic, exclusive of naturally occurring arsenic (that is, the increment of risk for arsenic above the background risk for arsenic). Attachment G3 of Appendix G contains the calculations for incremental risks.

Potential cancer risks and noncancer HIs, a measure of the potential for adverse health effects other than cancer, were calculated for the total, background, and incremental risk evaluations for arsenic. In addition, two sets of risks (cancer risks and HIs) were calculated for each of these evaluations: one set using EPA toxicity criteria, and another set using state of California toxicity criteria.

5.6 RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT

This section summarizes the results of the HHRA. The summary of results is limited to the incremental risk evaluation for arsenic; that is, the risks for arsenic that are attributable to site-related activities. Incremental risk results based on both federal and State of California toxicity criteria are discussed. Cancer risks calculated using State of California toxicity criteria for arsenic are higher than risks calculated using federal toxicity criteria by approximately a factor of 6.2 for the rancher, industrial worker, and residential receptors, and by a factor of 4.5 for the construction worker.

In the discussion below, "point of departure" refers to a cancer risk of 1E-06 and "risk management range" refers to the range of risks between 1E-04 and 1E-06 (see Section 5.5.1). "Threshold HI" refers to a noncancer HI of 1.0 (see Section 5.5.2). Tables 5-1 through 5-4 provide an overall summary of the cancer risk and noncancer HI results.

5.6.1 Group 1 Magazine Area

Incremental cancer risks and noncancer HIs were not calculated for the Group 1 Magazine Area because site concentrations for arsenic did not exceed background concentrations for any of the three soil depth intervals evaluated for this area. Therefore, no site-related health risks are associated with exposure to arsenic in soil at the Group 1 Magazine Area. Health risks for exposure to arsenic in this area are associated with naturally occurring background concentrations of arsenic.

5.6.2 Group 2 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 2 Magazine Area are summarized in Table 5-1.

Assessment of incremental risks for the Group 2 Magazine Area was limited to surface soil (0 to 0.5 foot bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil and combined surface and subsurface soil are associated with naturally occurring background concentrations of arsenic.

<u>Federal Toxicity Criteria</u>

The cancer risks for the current rancher (7E-07 – surface soil) and future construction worker (4E-07 – surface soil) are less than the point of departure of 1E-06. The cancer risks for the future industrial worker (6E-06 – surface soil) and future resident (2E-05 – surface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors are within the risk management range. Cancer risks range from 2E-06 for the future construction worker to 1E-04 for the future resident.

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

5.6.3 Group 3 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 3 Magazine Area are summarized in Table 5-2.

Assessment of incremental risks for the Group 3 Magazine Area was limited to surface soil (0 to 0.5 foot bgs) and combined surface and subsurface soil (0 to 10 feet bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil are associated with naturally occurring background concentrations of arsenic.

Federal Toxicity Criteria

The cancer risks for the current rancher (1E-06 – surface soil) and future construction worker (8E-07 – surface soil; 1E-06 – combined surface and subsurface soil) do not exceed the point of departure of 1E-06. The cancer risks for the future industrial worker (1E-05 – surface soil; 1E-05 – combined surface and subsurface soil) and future resident (4E-05 – surface soil; 5E-05 combined surface and subsurface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors are within the risk management range. Cancer risks range from 4E-06 for the future construction worker to 3E-04 for the future resident, which slightly exceeds the upper end of the risk management range.

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

5.6.4 Group 4 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 4 Magazine Area are summarized in Table 5-3.

Assessment of incremental risks for the Group 4 Magazine Area was limited to surface soil (0 to 0.5 foot bgs) and combined surface and subsurface soil (0 to 10 feet bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil are associated with naturally occurring background concentrations of arsenic (see Attachment G2 of Appendix G for background risk results).

Federal Toxicity Criteria

The cancer risks for the current rancher (9E-07 – surface soil) and future construction worker (6E-07 – surface soil; 6E-07 – combined surface and subsurface soil) do not exceed the point of departure of 1E-06. The cancer risks for the future industrial worker (8E-06 – surface soil; 8E-06 – combined surface and subsurface soil) and future resident (3E-05 – surface soil; 3E-05 combined surface and subsurface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors except the future resident are within the risk management range. Cancer risks range for nonresidential receptors range from 3E-06 for the future construction worker to 5E-05 for the future industrial worker. Cancer risks for the future resident slightly exceed the upper end of the risk management range (2E-04 – surface soil; 2E-04 combined surface and subsurface soil).

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

5.6.5 Group 5 Magazine Area

Incremental cancer risks and noncancer HIs for the Group 5 Magazine Area are summarized in Table 5-4.

Assessment of incremental risks for the Group 5 Magazine Area was limited to surface soil (0 to 0.5 foot bgs) and combined surface and subsurface soil (0 to 10 feet bgs). Statistical comparisons (see Appendix F) show that site concentrations of arsenic in subsurface soil (0.5 to 10 feet bgs) do not exceed background concentrations; therefore, incremental risks were not

calculated for this soil depth interval. Health risks for exposure to arsenic in subsurface soil are associated with naturally occurring background concentrations of arsenic (see Attachment G2 of Appendix G for background risk results).

Federal Toxicity Criteria

The cancer risks for the future construction worker (1E-06 – surface soil; 9E-07 – combined surface and subsurface soil) do not exceed the point of departure of 1E-06. The cancer risks for the current rancher (2E-06 – surface soil), future industrial worker (2E-05 – surface soil; 1E-05 – combined surface and subsurface soil) and future resident (6E-05 – surface soil; 4E-05 combined surface and subsurface soil) are within the risk management range of 1E-04 to 1E-06 for carcinogens.

The noncancer HIs for all receptors is less than the threshold of 1.0 for noncarcinogens.

State of California Toxicity Criteria

Using State of California criteria, cancer risks for all receptors except the future resident are within the risk management range. Cancer risks range for nonresidential receptors range from 4E-06 for the future construction worker to 1E-04 for the future industrial worker. Cancer risks for the future resident slightly exceed the upper end of the risk management range (4E-04 – surface soil; 3E-04 combined surface and subsurface soil).

The noncancer HIs for all receptors resulting from risk evaluations using federal toxicity criteria do not differ from the results using State of California toxicity criteria.

TABLE 5-1: INCREMENTAL HUMAN HEALTH RISK SUMMARY - GROUP 2 MAGAZINE AREA

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

FEDERAL TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	4.8E-07	4.3E-06	NE	NE	2.1E-07	NE	NE	1.9E-05	NE	NE
Dermal Contact with Soil	1.7E-07	1.5E-06			8.5E-08			1.9E-06		
Inhalation of Soil Particulates	3.2E-11	4.6E-09			1.2E-07			1.4E-08		
Total Cancer Risk	**7E-07**	**6E-06**			**4E-07**			**2E-05**		
NONCANCER HAZARD										
Soil Ingestion	3.0E-03	2.7E-02	NE	NE	3.2E-02	NE	NE	3.5E-01	NE	NE
Dermal Contact with Soil	1.0E-03	9.2E-03			1.3E-02			3.1E-02		
Inhalation of Soil Particulates	7.0E-07	1.0E-04			6.8E-02			4.6E-04		
Total Noncancer Hazard	**4E-03**	**4E-02**			**1E-01**			**4E-01**		

STATE TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	3.1E-06	2.7E-05	NE	NE	1.3E-06	NE	NE	1.2E-04	NE	NE
Dermal Contact with Soil	1.0E-06	9.4E-06			5.4E-07			1.2E-05		
Inhalation of Soil Particulates	2.6E-11	3.7E-09			1.0E-07			1.1E-08		
Total Cancer Risk	**4E-06**	**4E-05**			**2E-06**			**1E-04**		
NONCANCER HAZARD										
Soil Ingestion	3.0E-03	2.7E-02	NE	NE	3.2E-02	NE	NE	3.5E-01	NE	NE
Dermal Contact with Soil	1.0E-03	9.2E-03			1.3E-02			3.1E-02		
Inhalation of Soil Particulates	7.0E-07	1.0E-04			6.8E-02			4.6E-04		
Total Noncancer Hazard	**4E-03**	**4E-02**			**1E-01**			**4E-01**		

Notes:

1	Cancer risks for the future resident are based on combined cancer risks for an adult and child resident. Noncancer hazards for the future resident are based on noncancer hazards for a child resident.
ft bgs	Feet below ground surface
NE	Not evaluated - concentration not above background concentration

TABLE 5-2: INCREMENTAL HUMAN HEALTH RISK SUMMARY - GROUP 3 MAGAZINE AREA

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

FEDERAL TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	9.9E-07	8.8E-06	NE	1.1E-05	4.2E-07	NE	5.1E-07	3.9E-05	NE	4.8E-05
Dermal Contact with Soil	3.4E-07	3.0E-06		3.7E-06	1.7E-07		2.1E-07	3.8E-06		4.7E-06
Inhalation of Soil Particulates	6.5E-11	9.3E-09		1.1E-08	2.5E-07		3.1E-07	2.8E-08		3.5E-08
Total Cancer Risk	**1E-06**	**1E-05**		**1E-05**	**8E-07**		**1E-06**	**4E-05**		**5E-05**
NONCANCER HAZARD										
Soil Ingestion	6.1E-03	5.5E-02	NE	6.7E-02	6.5E-02	NE	8.0E-02	7.2E-01	NE	8.8E-01
Dermal Contact with Soil	2.1E-03	1.9E-02		2.3E-02	2.7E-02		3.3E-02	6.2E-02		7.6E-02
Inhalation of Soil Particulates	1.4E-06	2.0E-04		2.5E-04	1.4E-01		1.7E-01	9.5E-04		1.2E-03
Total Noncancer Hazard	**8E-03**	**7E-02**		**9E-02**	**2E-01**		**3E-01**	**8E-01**		**1E+00**

STATE TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	6.3E-06	5.6E-05	NE	6.8E-05	2.7E-06	NE	3.2E-06	2.5E-04	NE	3.1E-04
Dermal Contact with Soil	2.1E-06	1.9E-05		2.3E-05	1.1E-06		1.3E-06	2.4E-05		3.0E-05
Inhalation of Soil Particulates	5.2E-11	7.5E-09		9.2E-09	2.0E-07		2.5E-07	2.3E-08		2.8E-08
Total Cancer Risk	**8E-06**	**7E-05**		**9E-05**	**4E-06**		**5E-06**	**3E-04**		**3E-04**
NONCANCER HAZARD										
Soil Ingestion	6.1E-03	5.5E-02	NE	6.7E-02	6.5E-02	NE	8.0E-02	7.2E-01	NE	8.8E-01
Dermal Contact with Soil	2.1E-03	1.9E-02		2.3E-02	2.7E-02		3.3E-02	6.2E-02		7.6E-02
Inhalation of Soil Particulates	1.4E-06	2.0E-04		2.5E-04	1.4E-01		1.7E-01	9.5E-04		1.2E-03
Total Noncancer Hazard	**8E-03**	**7E-02**		**9E-02**	**2E-01**		**3E-01**	**8E-01**		**1E+00**

Notes:

1 Cancer risks for the future resident are based on combined cancer risks for an adult and child resident. Noncancer hazards for the future resident are based on noncancer hazards for a child resident.

ft bgs Feet below ground surface

NE Not evaluated - concentration not above background concentration

TABLE 5-3: INCREMENTAL HUMAN HEALTH RISK SUMMARY - GROUP 4 MAGAZINE AREA

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

FEDERAL TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	7.0E-07	6.2E-06	NE	5.8E-06	3.0E-07	NE	2.8E-07	2.8E-05	NE	2.6E-05
Dermal Contact with Soil	2.4E-07	2.1E-06		2.0E-06	1.2E-07		1.2E-07	2.7E-06		2.5E-06
Inhalation of Soil Particulates	4.6E-11	6.6E-09		6.2E-09	1.8E-07		1.7E-07	2.0E-08		1.9E-08
Total Cancer Risk	**9E-07**	**8E-06**		**8E-06**	**6E-07**		**6E-07**	**3E-05**		**3E-05**
NONCANCER HAZARD										
Soil Ingestion	4.3E-03	3.9E-02	NE	3.6E-02	4.6E-02	NE	4.3E-02	5.1E-01	NE	4.8E-01
Dermal Contact with Soil	1.5E-03	1.3E-02		1.2E-02	1.9E-02		1.8E-02	4.4E-02		4.1E-02
Inhalation of Soil Particulates	1.0E-06	1.4E-04		1.3E-04	9.7E-02		9.1E-02	6.7E-04		6.3E-04
Total Noncancer Hazard	**6E-03**	**5E-02**		**5E-02**	**2E-01**		**2E-01**	**6E-01**		**5E-01**

STATE TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	4.4E-06	3.9E-05	NE	3.7E-05	1.9E-06	NE	1.8E-06	1.8E-04	NE	1.7E-04
Dermal Contact with Soil	1.5E-06	1.3E-05		1.3E-05	7.8E-07		7.3E-07	1.7E-05		1.6E-05
Inhalation of Soil Particulates	3.7E-11	5.3E-09		5.0E-09	1.4E-07		1.3E-07	1.6E-08		1.5E-08
Total Cancer Risk	**6E-06**	**5E-05**		**5E-05**	**3E-06**		**3E-06**	**2E-04**		**2E-04**
NONCANCER HAZARD										
Soil Ingestion	4.3E-03	3.9E-02	NE	3.6E-02	4.6E-02	NE	4.3E-02	5.1E-01	NE	4.8E-01
Dermal Contact with Soil	1.5E-03	1.3E-02		1.2E-02	1.9E-02		1.8E-02	4.4E-02		4.1E-02
Inhalation of Soil Particulates	1.0E-06	1.4E-04		1.3E-04	9.7E-02		9.1E-02	6.7E-04		6.3E-04
Total Noncancer Hazard	**6E-03**	**5E-02**		**5E-02**	**2E-01**		**2E-01**	**6E-01**		**5E-01**

Notes:

1 Cancer risks for the future resident are based on combined cancer risks for an adult and child resident.
Noncancer hazards for the future resident are based on noncancer hazards for a child resident.

ft bgs Feet below ground surface

NE Not evaluated - concentration not above background concentration

TABLE 5-4: INCREMENTAL HUMAN HEALTH RISK SUMMARY - GROUP 5 MAGAZINE AREA

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

FEDERAL TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	1.3E-06	1.2E-05	NE	8.9E-06	5.5E-07	NE	4.2E-07	5.2E-05	NE	4.0E-05
Dermal Contact with Soil	4.4E-07	4.0E-06		3.0E-06	2.3E-07		1.7E-07	5.0E-06		3.8E-06
Inhalation of Soil Particulates	8.6E-11	1.2E-08		9.4E-09	3.3E-07		2.6E-07	3.7E-08		2.9E-08
Total Cancer Risk	**2E-06**	**2E-05**		**1E-05**	**1E-06**		**9E-07**	**6E-05**		**4E-05**
NONCANCER HAZARD										
Soil Ingestion	8.1E-03	7.2E-02	NE	5.5E-02	8.6E-02	NE	6.6E-02	9.4E-01	NE	7.2E-01
Dermal Contact with Soil	2.8E-03	2.5E-02		1.9E-02	3.6E-02		2.7E-02	8.2E-02		6.3E-02
Inhalation of Soil Particulates	1.9E-06	2.7E-04		2.0E-04	1.8E-01		1.4E-01	1.2E-03		9.5E-04
Total Noncancer Hazard	**1E-02**	**1E-01**		**7E-02**	**3E-01**		**2E-01**	**1E+00**		**8E-01**

STATE TOXICITY CRITERIA

Soil Exposure Pathway	Current Rancher	Future Industrial Worker			Future Construction Worker			Future Resident[1]		
Soil Depth Interval (ft bgs)	**0 - 0.5**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**	**0 - 0.5**	**0.5 - 10**	**0 - 10**
CANCER RISK										
Soil Ingestion	8.2E-06	7.3E-05	NE	5.6E-05	3.5E-06	NE	2.7E-06	3.3E-04	NE	2.5E-04
Dermal Contact with Soil	2.8E-06	2.5E-05		1.9E-05	1.4E-06		1.1E-06	3.2E-05		2.4E-05
Inhalation of Soil Particulates	6.9E-11	9.8E-09		7.5E-09	2.7E-07		2.0E-07	3.0E-08		2.3E-08
Total Cancer Risk	**1E-05**	**1E-04**		**8E-05**	**5E-06**		**4E-06**	**4E-04**		**3E-04**
NONCANCER HAZARD										
Soil Ingestion	8.1E-03	7.2E-02	NE	5.5E-02	8.6E-02	NE	6.6E-02	9.4E-01	NE	7.2E-01
Dermal Contact with Soil	2.8E-03	2.5E-02		1.9E-02	3.6E-02		2.7E-02	8.2E-02		6.3E-02
Inhalation of Soil Particulates	1.9E-06	2.7E-04		2.0E-04	1.8E-01		1.4E-01	1.2E-03		9.5E-04
Total Noncancer Hazard	**1E-02**	**1E-01**		**7E-02**	**3E-01**		**2E-01**	**1E+00**		**8E-01**

Notes:

1 Cancer risks for the future resident are based on combined cancer risks for an adult and child resident. Noncancer hazards for the future resident are based on noncancer hazards for a child resident.

ft bgs Feet below ground surface

NE Not evaluated - concentration not above background concentration

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
15	exposure pathways	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 5.1 and Figure 5-1. Tetra Tech. June 1, 2009.

and results is provided in Appendix G. Risks to human health were assessed separately for each of the five magazine areas (Groups 1 through 5) at Site 22A.

The specific objectives of the HHRA were to: (1) estimate the magnitude of potential risk to human health associated with current site conditions and potential future land use scenarios, (2) identify the environmental media and chemicals that pose the primary human health concerns, (3) identify the environmental media and chemicals that pose little or no threat to human health, and (4) provide a foundation for assessing the need for further response actions.

The HHRA for Site 22A consisted of the following five basic steps:

- **Conceptual Site Model:** This step involves identifying potential human receptors and potential pathways for receptor exposure at the site.
- **Data Evaluation and Identification of chemicals of potential concern (COPC):** This step consists of evaluating site data and identifying COPC in media sampled.
- **Exposure Assessment:** This step involves quantifying receptor intake of COPCs for exposure pathways identified as potentially complete.
- **Toxicity Assessment:** This step consists of compiling toxicity values that characterize potential adverse health effects from exposure to COPCs.
- **Risk Characterization:** This step quantitatively characterizes potential risks to human health associated with exposure to COPCs. Risks were characterized separately for each magazine area.

These steps of the HHRA are described below in Sections 5.1 through 5.5. Results of the HHRA are summarized in Section 5.6.

5.1 CONCEPTUAL SITE MODEL

The first step involved identifying sources of chemicals at each site, affected environmental media, chemicals release and transport mechanisms that may occur at the site, human receptor populations that may be exposed to the affected media under current or future site conditions, and potential exposure pathways for each receptor population. This information was summarized in a conceptual site model (CSM). Figure 5-1 presents the CSMs for Site 22A.

As shown in the CSM, arsenic-containing herbicides are the sole source of site chemicals at Site 22A; arsenic is the sole COPC for Site 22A (Tetra Tech 2007c). Four receptors were identified for evaluation in the HHRA:

- Current rancher
- Future industrial worker
- Future construction worker
- Future resident (adult and child)

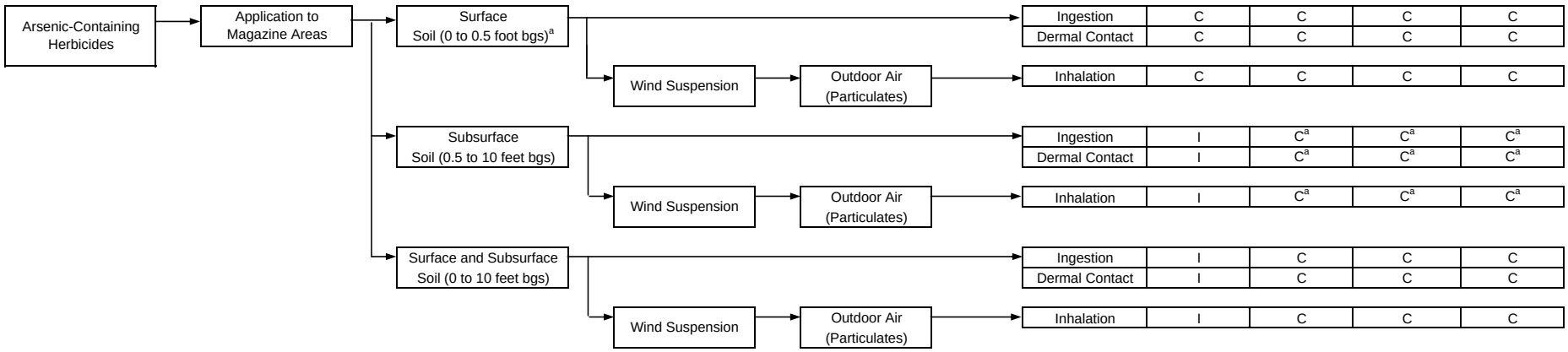
Health risks from exposure to arsenic were evaluated for each of these receptors for each of the five magazine areas. An unrestricted (residential) land-use scenario generally represents the greatest potential for exposure to site chemicals. Although the residential scenario is unlikely for Site 22A, it is evaluated to provide additional information to support risk management decisions for the site.

Potentially complete exposure pathways for each of these receptors are shown in the CSM (see Figure 5-1); cancer risks and noncancer hazards were quantified in the HHRA for each exposure pathway identified as potentially complete. Three exposure pathways for soil were identified as potentially complete for each receptor: (1) incidental soil ingestion, (2) dermal contact with soil, and (3) inhalation of arsenic adsorbed to windblown soil and released to outdoor air. Investigation of arsenic in groundwater was not required for this RI because concentrations of arsenic in soil that exceed background levels do not extend to the water table and groundwater is not considered to be affected by site sources of arsenic.

Exposure to surface soil (0 to 0.5 foot bgs) from direct contact was evaluated for both the current rancher and all future receptors and assumes that current site conditions are maintained or that any future use of the site is associated with minimal disturbance of site soils. Exposure to subsurface soil (0.5 to 10 feet bgs) and combined surface and subsurface soil (0 to 10 feet bgs) was also evaluated for all future receptors. Exposure to combined surface and subsurface soil assumes that future use of the site involves intrusive development and excavation of site soil, thereby mixing soils throughout the soil column and making deeper soils available at the surface for contact. Exposure to subsurface soil from 0.5 to 10 feet bgs was also evaluated under the same premise, but assumes that surface soil (0 to 0.5 foot bgs) at the site — where arsenic-containing herbicides were historically applied — is excavated before the site is developed.

5.2 DATA EVALUATION AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

This step consisted of evaluating the analytical data for usability in the HHRA, grouping the analytical data for soil by magazine area and soil depth interval. As discussed in Section 5.1, arsenic in soil is the sole COPC for Site 22A.



Notes:

bgs Below ground surface

a Exposure to subsurface soil was not evaluated for the Group 1 Magazine Area because subsurface soil samples were not collected for this area. Subsurface soil samples were not collected because concentrations of surface samples for arsenic did not exceed background concentrations. Therefore, it was concluded that arsenic has not migrated to subsurface soil, and subsurface soil exposure pathways are considered incomplete.

C Potentially complete exposure pathway

I Incomplete or negligible exposure pathway

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FIGURE 5-1

CONCEPTUAL SITE MODEL FOR SITE 22A MAGAZINE AREAS (GROUPS 1 THROUGH 5)

Remedial Investigation Report for Site 22A

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
16	total risks	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix G: Attachment G1. Tetra Tech. June 1, 2009.

ATTACHMENT G1
EPA RAGS PART D TABLES 1 THROUGH 9 – TOTAL RISK EVALUATION

(Tables to be provided on CD only)

TABLES

Exposure Pathways and Scenarios

G1-1.1 EPA RAGS Part D Table 1, Exposure Pathways and Scenarios

Data Summary and Comparison to Background Levels

G1-2.1 EPA RAGS Part D Table 2, Arsenic Data Summary and Comparison to Background Levels in Surface Soil (0-0.50 foot bgs) at Site 22A

G1-2.2 EPA RAGS Part D Table 2, Arsenic Data Summary and Comparison to Background Levels in Subsurface Soil (0.5-10 feet bgs) at Site 22A

G1-2.3 EPA RAGS Part D Table 2, Arsenic Data Summary and Comparison to Background Levels in Surface and Subsurface Soil (0-10 feet bgs) at Site 22A

Exposure Point Concentration Summaries

G1-3.1 EPA RAGS Part D Table 3, Exposure Point Concentration Summary, Surface Soil (0-0.5 foot bgs), Site 22A

G1-3.2 EPA RAGS Part D Table 3, Exposure Point Concentration Summary, Subsurface Soil (0.5-10 feet bgs), Site 22A

G1-3.3 EPA RAGS Part D Table 3, Exposure Point Concentration Summary, Surface and Subsurface Soil (0-10 feet bgs), Site 22A

Values Used for Daily Intake

G1-4.1 EPA RAGS Part D Table 4, Values Used for Daily Intake, RME Soil Exposures

Noncancer Toxicity Data

G1-5.1 EPA RAGS Part D Table 5, Federal Non-cancer Toxicity Data, Oral/Dermal

G1-5.2 EPA RAGS Part D Table 5, Federal Non-cancer Toxicity Data, Inhalation

G1-5.3 EPA RAGS Part D Table 5, State of California Non-cancer Toxicity Data, Oral/Dermal

G1-5.4 EPA RAGS Part D Table 5, State of California Non-cancer Toxicity Data, Inhalation

Cancer Toxicity Data

G1-6.1 EPA RAGS Part D Table 6, Federal Cancer Toxicity Data, Oral/Dermal

G1-6.2 EPA RAGS Part D Table 6, Federal Cancer Toxicity Data, Inhalation

G1-6.3 EPA RAGS Part D Table 6, State of California Cancer Toxicity Data, Oral/Dermal

G1-6.4 EPA RAGS Part D Table 6, State of California Cancer Toxicity Data, Inhalation

Chemical Cancer Risks and Noncancer Hazards, Federal Toxicity Criteria

G1-7.1.1 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Current Rancher

G1-8.1.1 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Current Rancher

G1-7.1.2 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G1-8.1.2 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G1-7.1.3 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Construction Worker

G1-8.1.3 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Construction Worker

G1-7.1.4 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult Resident

G1-8.1.4 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult Resident

G1-7.1.5 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Child Resident

G1-8.1.5 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Child Resident

G1-7.1.6 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult and Child Resident

G1-8.1.6 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult and Child Resident

Chemical Cancer Risks and Noncancer Hazards, State of California Toxicity Criteria

G1-7.2.1 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Rancher

G1-8.2.1 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Rancher

G1-7.2.2 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G1-8.2.2 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G1-7.2.3 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Construction Worker

G1-8.2.3 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Construction Worker

G1-7.2.4 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult Resident

G1-8.2.4 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult Resident

G1-7.2.5 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Child Resident

G1-8.2.5 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Child Resident

G1-7.2.6 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult and Child Resident

G1-8.2.6 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Total Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult and Child Resident

TABLE G1-1.1: EPA RAGS PART D TABLE 1, EXPOSURE PATHWAYS AND SCENARIOS

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Site	Exposure Scenario	Soil								
		Surface (0 to 0.5 foot bgs)			Subsurface (0.5 to 10 feet bgs)			Surface and Subsurface (0 to 10 feet bgs)		
		Incidental Ingestion	Dermal Contact	Inhalation (Outdoor Air - Particulates)	Incidental Ingestion	Dermal Contact	Inhalation (Outdoor Air - Particulates)	Incidental Ingestion	Dermal Contact	Inhalation (Outdoor Air - Particulates)
Magazine Areas (Groups 1 through 5)	Rancher (Current)	●	●	●	○	○	○	○	○	○
	Industrial (Future)	●	●	●	●[a]	●[a]	●[a]	●	●	●
	Construction Worker (Future)	●	●	●	●[a]	●[a]	●[a]	●	●	●
	Residential[b] (Future)	●	●	●	●[a]	●[a]	●[a]	●	●	●

Notes:

○	Incomplete or negligible exposure pathway
●	Potentially complete exposure pathway
a	Exposure to subsurface soil was not evaluated for the Group 1 Magazine Area because subsurface soil samples were not collected for this area. Subsurface soil samples were not collected because concentrations of surface samples for arsenic did not exceed background concentrations. Therefore, it was concluded that arsenic has not migrated to subsurface soil, and subsurface soil exposure pathways are considered incomplete.
b	Includes adult and child exposure
bgs	Below ground surface

TABLE G1-2.1: EPA RAGS PART D TABLE 2, ARSENIC DATA SUMMARY AND COMPARISON TO BACKGROUND LEVELS IN SURFACE SOIL (0 TO 0.5 FOOT BGS) AT SITE 22A

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

CAS Number	Magazine Area Group	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Sample Quantitation Limits	Site Concentrations Significantly Greater than Background? (1)	Include Chemical as a COPC? (2)
Metals										
7440382	1	Arsenic	2.14	6.92	mg/kg	GP1SB004	11 / 11		No	No
7440382	2	Arsenic	1.78	47.1	mg/kg	GP2SB012	44 / 44		Yes	Yes
7440382	3	Arsenic	3.27	67.1 J	mg/kg	GP3SS004	27 / 27		Yes	Yes
7440382	4	Arsenic	2.97 J	53	mg/kg	MAGCSB005	33 / 33		Yes	Yes
7440382	5	Arsenic	3.26	69	mg/kg	MAGDSB001	35 / 35		Yes	Yes

Notes:

(1) See Appendix F for a detailed description of the background evaluation

(2) Arsenic was retained as a COPCs for the total risk evaluation regardless of the results of the background evaluation. Arsenic was not retained as a COPC for the incremental risk evaluation if site concentrations were not significantly greater than background (see Section G.9).

Definitions:

--	Not applicable
bgs	Below ground surface
CAS	Chemical Abstract Service
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
J	Estimated value
mg/kg	Milligram per kilogram
RAGS	Risk Assessment Guidance for Superfund

TABLE G1-2.2: EPA RAGS PART D TABLE 2, ARSENIC DATA SUMMARY AND COMPARISON TO BACKGROUND LEVELS IN SUBSURFACE SOIL (0.5 TO 10 FEET BGS) AT SITE 22A

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

CAS Number	Magazine Area Group	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Sample Quantitation Limits	Site Concentrations Significantly Greater than Background? (1)	Include Chemical as a COPC? (2)
Metals										
7440382	2	Arsenic	3.05	5.74	mg/kg	GP2SB013	6 / 6		No	No
7440382	3	Arsenic	4.04	9.29	mg/kg	GP3SB005	6 / 6		No	No
7440382	4	Arsenic	3.91	43.1	mg/kg	GP4SB006	6 / 6		No	No
7440382	5	Arsenic	2.23	5.82	mg/kg	GP5SB012	9 / 9		No	No

Notes:

(1) See Appendix F for a detailed description of the background evaluation

(2) Arsenic was retained as a COPCs for the total risk evaluation regardless of the results of the background evaluation. Arsenic was not retained as a COPC for the incremental risk evaluation if site concentrations were not significantly greater than background (see Section G.9).

Definitions:

--	Not applicable
bgs	Below ground surface
CAS	Chemical Abstract Service
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
mg/kg	Milligram per kilogram
RAGS	Risk Assessment Guidance for Superfund

TABLE G1-2.3: EPA RAGS PART D TABLE 2, ARSENIC DATA SUMMARY AND COMPARISON TO BACKGROUND LEVELS IN SURFACE AND SUBSURFACE SOIL (0 TO 10 FEET BGS) AT SITE 22A

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

CAS Number	Magazine Area Group	Chemical	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Sample Quantitation Limits	Site Concentrations Significantly Greater than Background? (1)	Include Chemical as a COPC? (2)
Metals										
7440382	1	Arsenic	2.14	6.92	mg/kg	GP1SB004	11 / 11		No	No
7440382	2	Arsenic	1.78	47.1	mg/kg	GP2SB012	50 / 50		No	No
7440382	3	Arsenic	3.27	67.1 J	mg/kg	GP3SS004	33 / 33		Yes	Yes
7440382	4	Arsenic	2.97 J	53	mg/kg	MAGCSB005	39 / 39		Yes	Yes
7440382	5	Arsenic	2.23	69	mg/kg	MAGDSB001	44 / 44		Yes	Yes

Notes:

(1) See Appendix F for a detailed description of the background evaluation

(2) Arsenic was retained as a COPCs for the total risk evaluation regardless of the results of the background evaluation. Arsenic was not retained as a COPC for the incremental risk evaluation if site concentrations were not significantly greater than background (see Section G.9).

Definitions:

--	Not applicable
bgs	Below ground surface
CAS	Chemical Abstract Service
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
J	Estimated value
mg/kg	Milligram per kilogram
RAGS	Risk Assessment Guidance for Superfund

TABLE G1-3.1: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SURFACE SOIL (0 TO 0.5 FOOT BGS) AT SITE 22A

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current/Future
Medium:	Surface Soil (0-0.5 feet bgs)
Exposure Medium:	Soil

Exposure Point	Magazine Area Group	Chemical of Potential Concern	Units	Detection Frequency	Number of High Censored Results (a)	Arithmetic Mean	95 UCL Distribution (b)		Maximum Concentration (qualifier)		Exposure Point Concentration			
											Value	Units	Statistic (c)	Rationale (d)
Surface Soil	**Metals**													
(0 to 0.5 feet bgs)	1	Arsenic	mg/kg	11 / 11	0	4.03E+00	4.82E+00	N	6.92E+00		4.82E+00	mg/kg	95 UCL	(1)
	2	Arsenic	mg/kg	44 / 44	0	1.07E+01	1.83E+01	NP	4.71E+01		1.83E+01	mg/kg	95 UCL	(2)
	3	Arsenic	mg/kg	27 / 27	0	1.95E+01	2.68E+01	G	6.71E+01	J	2.68E+01	mg/kg	95 UCL	(3)
	4	Arsenic	mg/kg	33 / 33	0	1.18E+01	2.19E+01	NP	5.30E+01		2.19E+01	mg/kg	95 UCL	(2)
	5	Arsenic	mg/kg	35 / 35	0	1.74E+01	3.21E+01	NP	6.90E+01		3.21E+01	mg/kg	95 UCL	(2)

Notes:

See Appendix F for a detailed description of the statistical methods used.

EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
J	Estimated value
mg/kg	Milligram per kilogram
UCL	One-sided 95 percent upper confidence limit of the mean. Following EPA (2002, 2007), this can be estimated using either a 95, 97.5, or 99 percent UCL depending on the relative sample-size, detection frequency and skewness of the data.
a	Number of censored (nondetect) results that exceeded the maximum detected concentration. These results were excluded from the statistical calculations.
b	Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Cramer von Mises W ^{2} test (gamma distributions). A 5 percent level of significance was used in all tests. Distribution tests were only conducted for samples with at least 8 detected measurements. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations. Distribution Codes: G= gamma, N= normal, NP= nonparametric
c	The EPC is the lesser of the UCL and the maximum detected result The maximum detected result is the default when there are fewer than four detected results.
d	All methods follow EPA (2002, 2007). Method (Statistic) Codes are defined as follows:
(1)	95 percent UCL calculated using Student's *t* distribution
(2)	95 percent UCL calculated using the nonparametric Chebyshev method
(3)	95 percent UCL calculated using the approximate gamma method

References:

EPA. 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2007. "ProUCL Version 4.0 Technical Guide." Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. April.

TABLE G1-3.2: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SUBSURFACE SOIL (0.5 TO 10 FEET BGS) AT SITE 22A

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current/Future
Medium:	Subsurface Soil (0.5-10 feet bgs)
Exposure Medium:	Soil

Exposure Point	Magazine Area Group	Chemical of Potential Concern	Units	Detection Frequency	Number of High Censored Results (a)	Arithmetic Mean	95 UCL Distribution (b)		Maximum Concentration (qualifier)	Exposure Point Concentration			
										Value	Units	Statistic (c)	Rationale (d)
Subsurface Soil	**Metals**												
(0.5-10 feet bgs)	2	Arsenic	mg/kg	6 / 6	0	4.15E+00	4.88E+00	NP	5.74E+00	4.88E+00	mg/kg	95 UCL	(1)
	3	Arsenic	mg/kg	6 / 6	0	5.12E+00	6.81E+00	NP	9.29E+00	6.81E+00	mg/kg	95 UCL	(1)
	4	Arsenic	mg/kg	6 / 6	0	1.16E+01	3.94E+01	NP	4.31E+01	3.94E+01	mg/kg	95 UCL	(2)
	5	Arsenic	mg/kg	9 / 9	0	4.28E+00	4.98E+00	N	5.82E+00	4.98E+00	mg/kg	95 UCL	(1)

Notes:

See Appendix F for a detailed description of the statistical methods used.

EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
J	Estimated value
mg/kg	Milligram per kilogram
UCL	One-sided 95 percent upper confidence limit of the mean. Following EPA (2002, 2007), this can be estimated using either a 95, 97.5, or 99 percent UCL depending on the relative sample-size, detection frequency and skewness of the data.
a	Number of censored (nondetect) results that exceeded the maximum detected concentration. These results were excluded from the statistical calculations.
b	Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Cramer von Mises W ^{2} test (gamma distributions). A 5 percent level of significance was used in all tests. Distribution tests were only conducted for samples with at least 8 detected measurements. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations. Distribution Codes: N= normal, NP= nonparametric
c	The EPC is the lesser of the UCL and the maximum detected result The maximum detected result is the default when there are fewer than four detected results.
d	All methods follow EPA (2002, 2007). Method (Statistic) Codes are defined as follows:
(1)	95 percent UCL calculated using Student's *t* distribution
(2)	95 percent UCL calculated using the nonparametric Chebyshev method

References:

EPA. 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2007. "ProUCL Version 4.0 Technical Guide." Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. April.

TABLE G1-3.3: EPA RAGS PART D TABLE 3, EXPOSURE POINT CONCENTRATION SUMMARY, SURFACE AND SUBSURFACE SOIL (0 TO 10 FEET BGS) AT SITE 22A

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (0-10 feet bgs)
Exposure Medium:	Soil

Exposure Point	Magazine Area Group	Chemical of Potential Concern	Units	Detection Frequency	Number of High Censored Results (a)	Arithmetic Mean	95 UCL Distribution (b)		Maximum Concentration (qualifier)		Exposure Point Concentration			
											Value	Units	Statistic (c)	Rationale (d)
Surface and Subsurface Soil (0-10 feet bgs)	**Metals**													
	1	Arsenic	mg/kg	11 / 11	0	4.03E+00	4.82E+00	N	6.92E+00		4.82E+00	mg/kg	95 UCL	(1)
	2	Arsenic	mg/kg	50 / 50	0	9.92E+00	1.67E+01	NP	4.71E+01		1.67E+01	mg/kg	95 UCL	(2)
	3	Arsenic	mg/kg	33 / 33	0	1.68E+01	3.06E+01	NP	6.71E+01	J	3.06E+01	mg/kg	95 UCL	(2)
	4	Arsenic	mg/kg	39 / 39	0	1.18E+01	2.12E+01	NP	5.30E+01		2.12E+01	mg/kg	95 UCL	(2)
	5	Arsenic	mg/kg	44 / 44	0	1.48E+01	2.69E+01	NP	6.90E+01		2.69E+01	mg/kg	95 UCL	(2)

Notes:

See Appendix F for a detailed description of the statistical methods used.

EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
J	Estimated value
mg/kg	Milligram per kilogram
UCL	One-sided 95 percent upper confidence limit of the mean. Following EPA (2002, 2007), this value can be estimated using either a 95, 97.5, or 99 percent UCL depending on the relative sample size, detection frequency, and skewness of the data.
a	Number of censored (nondetect) results that exceeded the maximum detected concentration. These results were excluded from the statistical calculations.
b	Tested for detected data only using the Shapiro-Wilk W test (normal and lognormal distributions) and the Cramer von Mises W ^{2} test (gamma distributions). A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least eight detected measurements. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations. Distribution Codes: N= normal, NP= nonparametric
c	The EPC is the lesser of the UCL and the maximum detected result The maximum detected result is the default when there are fewer than four detected results.
d	All methods follow EPA (2002, 2007). Method (Statistic) Codes are defined as follows:
(1)	95 percent UCL calculated using Student's *t* distribution
(2)	95 percent UCL calculated using the nonparametric Chebyshev method

References:

EPA. 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2007. "ProUCL Version 4.0 Technical Guide." Prepared by Singh, A. and A.K. Singh. EPA/600/R-07/041. April.

TABLE G1-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL EXPOSURES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current and Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation / Model Name (1)
Incidental Ingestion	Current Rancher	Adult	Magazine Areas	CS	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (CS x FI x IR-S x EF x ED x MCF) / (BW x AT)
				IR-S	Ingestion Rate - Soil	100	mg/day	EPA 2002; EPA 2008	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	28	days/year	Site-specific	
				ED	Exposure Duration	25	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT-C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT-NC	Averaging Time - Noncancer	9,125	days	EPA 1989	
	Future Commercial/ Industrial Worker	Adult	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x FI x I_S x EF x ED x MCF) / (BW x AT)
				I_S	Ingestion Rate - Soil	100	mg/day	EPA 2002; EPA 2008	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	250	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	25	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	9,125	days	EPA 1989	
	Future Construction Worker	Adult	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x FI x I_S x EF x ED x MCF) / (BW x AT)
				I_S	Ingestion Rate - Soil	330	mg/day	EPA 2002	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	90	days/year	Professional judgment	
				ED	Exposure Duration	1	years	EPA 2002	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	365	days	EPA 1989	

TABLE G1-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL EXPOSURES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current and Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation / Model Name (1)
Incidental Ingestion (Continued)	Future Resident	Adult	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x FI x I_S x EF x ED x MCF) / (BW x AT)
				I_S	Ingestion Rate - Soil	100	mg/day	EPA 2002; EPA 2008	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	350	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	24	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	8,760	days	EPA 1989	
		Child	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x FI x I_S x EF x ED x MCF) / (BW x AT)
				I_S	Ingestion Rate - Soil	200	mg/day	EPA 2002; EPA 2008	
				FI	Fraction Ingested	1	unitless	Professional judgment	
				EF	Exposure Frequency	350	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	6	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	2,190	days	EPA 1989	

TABLE G1-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL EXPOSURES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current and Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation / Model Name (1)
Dermal Contact	Current Rancher	Adult	Magazine Areas	CS	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	0.03	unitless	EPA 2004	
				SA	Exposed Skin Surface Area	5,700	cm^2/day	DTSC 2000	
				AF	Soil-to-Skin Adherence Factor	0.2	mg/cm^2	DTSC 2000; EPA 2004	
				EF	Exposure Frequency	28	days/year	Site-specific	
				ED	Exposure Duration	25	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT-C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT-NC	Averaging Time - Noncancer	9,125	days	EPA 1989	
	Future Commercial/ Industrial Worker	Adult	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	unitless	EPA 2004	
				SA	Exposed Skin Surface Area	5,700	cm^2/day	DTSC 2000	
				AF	Soil-to-Skin Adherence Factor	0.2	mg/cm^2	DTSC 2000; EPA 2004	
				EF	Exposure Frequency	250	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	25	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	9,125	days	EPA 1989	
	Future Construction Worker	Adult	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	0.03	unitless	EPA 2004	
				SA	Exposed Skin Surface Area	5,700	cm^2/day	DTSC 2000	
				AF	Soil-to-Skin Adherence Factor	0.8	mg/cm^2	DTSC 2000	
				EF	Exposure Frequency	90	days/year	Professional judgment	
				ED	Exposure Duration	1	years	EPA 2002	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	365	days	EPA 1989	

TABLE G1-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL EXPOSURES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current and Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation / Model Name (1)
Dermal Contact (Continued)	Future Resident	Adult	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	0.03	unitless	EPA 2004	
				SA	Exposed Skin Surface Area	5,700	cm^2/day	DTSC 2000; EPA 2004	
				AF	Soil-to-Skin Adherence Factor	0.07	mg/cm^2	DTSC 2000; EPA 2004	
				EF	Exposure Frequency	350	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	24	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	8,760	days	EPA 1989	
		Child	Magazine Areas	C_S	Chemical Concentration in Soil	EPC	mg/kg	See Tables G1-3.1 through G1-3.3.	Intake (mg/kg-day) = (C_S x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	0.03	unitless	EPA 2004	
				SA	Exposed Skin Surface Area	2,900	cm^2	DTSC 2000	
				AF	Soil-to-Skin Adherence Factor	0.2	mg/cm^2	DTSC 2000; EPA 2004	
				EF	Exposure Frequency	350	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	6	years	EPA 2002; EPA 2008	
				MCF	Mass Conversion Factor	1E-06	kg/mg	Not applicable	
				BW	Body Weight	15	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	2,190	days	EPA 1989	

TABLE G1-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL EXPOSURES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current and Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation / Model Name (1)
Inhalation of Particulates Released from Soil to Outdoor Air	Current Rancher	Adult	Magazine Areas	CA	Chemical Concentration in Air	Chemical-specific	mg/m^3	Calculated from CS	Intake (mg/kg-day) = (CA x InhR x ET x EF x ED) / (BW x AT)
				InhR	Inhalation Rate	1.75	m^3/hour	DTSC 2005	where CA= CS / PEF
				ET	Exposure Time	0.5	hours/day	Site-specific	and PEF = 1.32E+09 m^3/kg (EPA 2008)
				EF	Exposure Frequency	28	days/year	Site-specific	
				ED	Exposure Duration	25	years	EPA 2002; EPA 2008	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT-C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT-NC	Averaging Time - Noncancer	9,125	days	EPA 1989	
	Future Commercial/ Industrial Worker	Adult	Magazine Areas	C_A	Chemical Concentration in Outdoor Air	Chemical-specific	mg/m^3	Calculated from C_S	Intake (mg/kg-day) = (C_A x InhR x ET x EF x ED) / (BW x AT)
				InhR	Inhalation Rate	1.75	m^3/hour	DTSC 2000	where CA= CS / PEF
				ET	Exposure Time	8	hours/day	EPA 1991	and PEF = 1.32E+09 m^3/kg (EPA 2008)
				EF	Exposure Frequency	250	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	25	years	EPA 2002; EPA 2008	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	9,125	days	EPA 1989	
	Future Construction Worker	Adult	Magazine Areas	C_A	Chemical Concentration in Outdoor Air	Chemical-specific	mg/m^3	Calculated from C_S	Intake (mg/kg-day) = (C_A x InhR x ET x EF x ED) / (BW x AT)
				InhR	Inhalation Rate	2.5	m^3/hour	EPA 1991	where CA= CS / PEF
				ET	Exposure Time	8	hours/day	EPA 1991	and PEF = 1.0E+06 m^3/kg (DTSC 2005)
				EF	Exposure Frequency	250	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	1	years	EPA 2002; EPA 2008	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	365	days	EPA 1989	

TABLE G1-4.1: EPA RAGS PART D TABLE 4, VALUES USED FOR DAILY INTAKE, RME SOIL EXPOSURES

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current and Future
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation / Model Name (1)
Inhalation of Particulates Released from Soil to Outdoor Air (continued)	Future Resident	Adult	Magazine Areas	C_A	Chemical Concentration in Outdoor Air	Chemical-specific	mg/m^3	Calculated from C_S	Intake (mg/kg-day) = (C_A x InhR x ET x EF x ED) / (BW x AT)
				InhR	Inhalation Rate	0.83	m^3/hour	EPA 2002; EPA 2008	where CA= CS / PEF
				ET	Exposure Time	24	hours/day	EPA 2002; EPA 2008	and PEF = 1.32E+09 m^3/kg (EPA 2008)
				EF	Exposure Frequency	350	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	24	years	EPA 2002; EPA 2008	
				BW	Body Weight	70	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	8,760	days	EPA 1989	
		Child	Magazine Areas	C_A	Chemical Concentration in Outdoor Air	Chemical-specific	mg/m^3	Calculated from C_S	Intake (mg/kg-day) = (C_A x InhR x ET x EF x ED) / (BW x AT)
				InhR	Inhalation Rate	0.42	m^3/hour	EPA 2002; EPA 2008	where CA= CS / PEF
				ET	Exposure Time	24	hours/day	EPA 2002; EPA 2008	and PEF = 1.32E+09 m^3/kg (EPA 2008)
				EF	Exposure Frequency	350	days/year	EPA 2002; EPA 2008	
				ED	Exposure Duration	6	years	EPA 2002; EPA 2008	
				BW	Body Weight	15	kg	EPA 2002; EPA 2008	
				AT_C	Averaging Time - Cancer	25,550	days	EPA 1989	
				AT_{NC}	Averaging Time - Noncancer	2,190	days	EPA 1989	

Notes:

(1) See Section G.4.4 in Appendix G for discussion of the intake assumptions.

Definitions:

cm^2	Square centimeter	mg/cm^2	Milligrams per square centimeter
days/year	Days per year	mg/day	Milligrams per day
DTSC	Department of Toxic Substances Control	mg/kg	Milligrams per kilogram
EPA	U.S. Environmental Protection Agency	mg/m^3	Milligrams per cubic meter
EPC	Exposure point concentration	m^3/hour	Cubic meters per hour
hours/day	Hours per day	m^3/kg	Cubic meters of air per kg soil (reduced from mg/m3-air per mg/kg-soil)
kg	Kilogram	PEF	Particulate emission factor
kg/mg	Kilograms per milligram	RME	Reasonable maximum exposure

References:

Department of Toxic Substances Control (DTSC). 2000. "Interoffice Memorandum Regarding Guidance for the Dermal Exposure Pathway." From S.M. DiZio, M.J. Wade, and D.J. Oudiz. To Human Health and Ecological Division. January 7.

DTSC. 2005. "Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Military Facilities." HERD HHRA Note Number 1. October 27. Available on-line at: http://www.dtsc.ca.gov/AssessingRisk/upload/HHRA_Note1.pdf

U.S. Environmental Protection Agency (EPA). 1989. "Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part A)." Office of Emergency and Remedial Response (OERR). Washington, D.C. December.

EPA. 1991. Interoffice Memorandum Regarding Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. From T. Fields, Jr., and B. Diamond. To Director, Waste Management Division, Regions I, IV, V, and VII; Director, Emergency and Remedial Response Division, Region III; Director, Hazardous Waste Management Division, Regions III, VI, VIII, and IX; Director, Hazardous Waste Division, Region X. March 25.

EPA. 2002. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites." Office of Solid Waste and Emergency Response. WSWER 9355.4-24. December.

EPA. 2004. "Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final." Office of Superfund Remediation and Technology Innovation. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. Washington, D.C. July.

EPA. 2008. Regional Screening Levels for Chemical Contaminants at Superfund Sites. July 7. Available on-line at: http://epa-prgs.ornl.gov/chemicals/download.shtml

TABLE G1-5.1: EPA RAGS PART D TABLE 5, FEDERAL NONCANCER TOXICITY DATA - ORAL / DERMAL

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Corcord, California

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (a)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Oral Reference Dose	
		Value	Units		Value	Units			Source(s)	Date(s)
Arsenic	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Skin	3	IRIS	07/18/2008

Notes:

a An oral absorption efficiency of 100 percent was assumed for all chemicals.

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
IRIS	EPA Integrated Risk Information System (EPA 2008)
mg/kg-day	Milligram per kilogram per day
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose

References:

EPA. 2008. Integrated Risk Information System (IRIS). On-line Database. Office of Research and Development, National Center for Environmental Assessment. Available on-line at: http://www.epa.gov/iris. Accessed July 18.

TABLE G1-5.2: EPA RAGS PART D TABLE 5, FEDERAL NONCANCER TOXICITY DATA - INHALATION

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Inhalation Reference Concentration	
		Value	Units	Value	Units			Source(s)	Date(s)
Arsenic	Chronic	3.0E-05	mg/m^3	8.6E-06	mg/kg-day	Developmental, Cardiovascular, CNS	1,000	OEHHA	07/18/2008

Definitions:

-- Not available; not applicable

CNS Central nervous system

EPA U.S. Environmental Protection Agency

mg/k Milligram per kilogram per day

mg/n Milligram per cubic meter

OEH California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Chronic Reference Exposure Level (REL) Values (OEHHA 2005)

RAG Risk Assessment Guidance for Superfund

RfC Reference concentration

RfD Reference dose

References:

OEHHA. 2005. "Chronic Reference Exposure Levels." August. Available on-line at: http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html

TABLE G1-5.3: EPA RAGS PART D TABLE 5, STATE OF CALIFORNIA NONCANCER TOXICITY DATA - ORAL / DERMAL

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (a)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Oral Reference Dose	
		Value	Units		Value	Units			Source(s)	Date(s)
Arsenic	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Skin	3	IRIS	07/18/2008

Notes:

a An oral absorption efficiency of 100 percent was assumed for all chemicals.

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
IRIS	EPA Integrated Risk Information System (EPA 2008)
mg/kg-day	Milligram per kilogram per day
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose

References:

EPA. 2008. Integrated Risk Information System (IRIS). On-line Database. Office of Research and Development, National Center for Environmental Assessment. Available onl-ine at: http://www.epa.gov/iris. Accessed July 18.

TABLE G1-5.4: EPA RAGS PART D TABLE 5, STATE OF CALIFORNIA NONCANCER TOXICITY DATA - INHALATION

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord California

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Inhalation Reference Concentration	
		Value	Units	Value	Units			Source(s)	Date(s)
Arsenic	Chronic	3.0E-05	mg/m^3	8.6E-06	mg/kg-day	evelopmental, Cardiovascular, CN	1,000	OEHHA	07/18/2008

Notes

Definitions:

--	Not available; not applicable
CNS	Central nervous system
EPA	U.S. Environmental Protection Agency
mg/kg-day	Milligram per kilogram per day
mg/m^3	Milligram per cubic meter
OEHHA	California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Chronic Reference Exposure Level (REL) Values (OEHHA 2005)
RAGS	Risk Assessment Guidance for Superfund
RfC	Reference concentration
RfD	Reference dose

References:

OEHHA. 2005. "Chronic Reference Exposure Levels." August. Available on-line at: http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html

TABLE G1-6.1: EPA RAGS PART D TABLE 6, FEDERAL CANCER TOXICITY DATA - ORAL / DERMAL

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (a)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral Cancer Slope Factor	
	Value	Units		Value	Units		Source(s)	Date(s)
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	100%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	07/18/2008

Notes:

a An oral absorption efficiency of 100 percent was assumed for all chemicals.

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
IRIS	EPA Integrated Risk Information System (EPA 2008)
mg/kg-day	Milligram per kilogram per day
RAGS	Risk Assessment Guidance for Superfund

References:

EPA. 2008. Integrated Risk Information System (IRIS). On-line Database. Office of Research and Development, National Center for Environmental Assessment. Available on-line at: http://www.epa.gov/iris. Accessed July 18.

TABLE G1-6.2: EPA RAGS PART D TABLE 6, FEDERAL CANCER TOXICITY DATA - INHALATION

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk: Inhalation Cancer Slope Factor	
	Value	Units	Value	Units		Source(s)	Date(s)
Arsenic	4.3E-03	$(\mu g/m^3)^{-1}$	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	07/18/2008

Notes:

Definitions:

--	Not available; not applicable
$\mu g/m^3$	Micrograms per cubic meter
EPA	U.S. Environmental Protection Agency
IRIS	EPA Integrated Risk Information System (EPA 2008)
mg/kg-day	Milligram per kilogram per day
RAGS	Risk Assessment Guidance for Superfund

References:

EPA. 2008. Integrated Risk Information System (IRIS). On-line Database. Office of Research and Development, National Center for Environmental Assessment. Available on-line a
http://www.epa.gov/iris. Accessed July 18.

TABLE G1-6.3: EPA RAGS PART D TABLE 6, STATE OF CALIFORNIA CANCER TOXICITY DATA - ORAL / DERMAL

Remedial Investigation Report for Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (a)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral Cancer Slope Factor	
	Value	Units		Value	Units		Source(s)	Date(s)
Arsenic	9.5E+00	$(mg/kg\text{-}day)^{-1}$	100%	9.5E+00	$(mg/kg\text{-}day)^{-1}$	A	OEHHA	07/18/2008

Notes:

a An oral absorption efficiency of 100 percent was assumed for all chemicals.

Definitions:

--	Not available; not applicable
EPA	U.S. Environmental Protection Agency
mg/kg-day	Milligram per kilogram per day
OEHHA	California Environmental Protection Agency Office of Environmental Health Haz Assessment cancer potency values (OEHHA 2008).
RAGS	Risk Assessment Guidance for Superfund

References:

OEHHA. 2008. "Cancer Potency List." January 25. Available on-line at: http://www.oehha.ca.gov/risk/pdf/TCDB061207.pdf

TABLE G1-6.4: EPA RAGS PART D TABLE 6, STATE OF CALIFORNIA CANCER TOXICITY DATA - INHALATION

Remedial Investigation Report for Installation Restoration Site 22A

Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk: Inhalation Cancer Slope Factor	
	Value	Units	Value	Units		Source(s)	Date(s)
Arsenic	3.3E-03	$(\mu g/m^3)^{-1}$	1.2E+01	$(mg/kg\text{-}day)^{-1}$	A	OEHHA	07/18/2008

Notes:

Definitions:

--	Not available; not applicable
$\mu g/m^3$	Micrograms per cubic meter
EPA	U.S. Environmental Protection Agency
mg/kg-day	Milligram per kilogram per day
OEHHA	California Environmental Protection Agency Office of Environmental Health Hazard Assessment cancer potency values (OEHHA 2008).
RAGS	Risk Assessment Guidance for Superfund

References:

OEHHA. 2008. "Cancer Potency List." January 25. Available on-line at: http://www.oehha.ca.gov/risk/pdf/TCDB061207.pdf

TABLE G1-7.1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NA	NA	1.5E+00	1.9E-07	2.8E-07	NA		NA		3.0E-04	5.3E-07	1.8E-03	NA		NA	
		Dermal	Arsenic	4.8E+00			1.5E+00	6.5E-08	9.7E-08					3.0E-04	1.8E-07	6.0E-04				
	Exposure Point Total								3.8E-07							2.4E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00			1.5E+01	1.3E-12	1.9E-11					8.6E-06	3.5E-12	4.1E-07				
	Exposure Point Total								1.9E-11							4.1E-07				
Exposure Medium Total - Group 1 Magazine Area									**3.8E-07**							**2.4E-03**				
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	NA	NA	1.5E+00	7.1E-07	1.1E-06	NA		NA		3.0E-04	2.0E-06	6.7E-03	NA		NA	
		Dermal	Arsenic	1.8E+01			1.5E+00	2.4E-07	3.7E-07					3.0E-04	6.8E-07	2.3E-03				
	Exposure Point Total								1.4E-06							8.9E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01			1.5E+01	4.7E-12	7.1E-11					8.6E-06	1.3E-11	1.5E-06				
	Exposure Point Total								7.1E-11							1.5E-06				
Exposure Medium Total - Group 2 Magazine Area									**1.4E-06**							**8.9E-03**				
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	NA	NA	1.5E+00	1.0E-06	1.6E-06	NA		NA		3.0E-04	2.9E-06	9.8E-03	NA		NA	
		Dermal	Arsenic	2.7E+01			1.5E+00	3.6E-07	5.4E-07					3.0E-04	1.0E-06	3.3E-03				
	Exposure Point Total								2.1E-06							1.3E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01			1.5E+01	7.0E-12	1.0E-10					8.6E-06	1.9E-11	2.3E-06				
	Exposure Point Total								1.0E-10							2.3E-06				
Exposure Medium Total - Group 3 Magazine Area									**2.1E-06**							**1.3E-02**				
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	NA	NA	1.5E+00	8.6E-07	1.3E-06	NA		NA		3.0E-04	2.4E-06	8.0E-03	NA		NA	
		Dermal	Arsenic	2.2E+01			1.5E+00	2.9E-07	4.4E-07					3.0E-04	8.2E-07	2.7E-03				
	Exposure Point Total								1.7E-06							1.1E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01			1.5E+01	5.7E-12	8.5E-11					8.6E-06	1.6E-11	1.8E-06				
	Exposure Point Total								8.5E-11							1.8E-06				
Exposure Medium Total - Group 4 Magazine Area									**1.7E-06**							**1.1E-02**				
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	NA	NA	1.5E+00	1.3E-06	1.9E-06	NA		NA		3.0E-04	3.5E-06	1.2E-02	NA		NA	
		Dermal	Arsenic	3.2E+01			1.5E+00	4.3E-07	6.4E-07					3.0E-04	1.2E-06	4.0E-03				
	Exposure Point Total								2.5E-06							1.6E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01			1.5E+01	8.3E-12	1.2E-10					8.6E-06	2.3E-11	2.7E-06				
	Exposure Point Total								1.2E-10							2.7E-06				
Exposure Medium Total - Group 5 Magazine Area									**2.5E-06**							**1.6E-02**				

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NA	Not applicable - no complete exposure pathways for this depth interval for this receptor	RME	Reasonable maximum exposure
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund		
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose		
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)				

TABLE G1-8.1.1

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	2.8E-07	--	9.7E-08	3.8E-07	NA				NA				Skin	1.8E-03	--	6.0E-04	2.4E-03	NA				NA			
	Exposure Point Total					3.8E-07													2.4E-03								
	Outdoor Air	Arsenic	--	1.9E-11	--	1.9E-11									Developmental, Cardiovascular, CNS	--	4.1E-07	--	4.1E-07								
	Exposure Point Total					1.9E-11													4.1E-07								
Exposure Medium Total - Group 1 Magazine Area						**3.8E-07**													**2.4E-03**								
Group 2	Site Soil	Arsenic	1.1E-06	--	3.7E-07	1.4E-06	NA				NA				Skin	6.7E-03	--	2.3E-03	8.9E-03	NA				NA			
	Exposure Point Total					1.4E-06													8.9E-03								
	Outdoor Air	Arsenic	--	7.1E-11	--	7.1E-11									Developmental, Cardiovascular, CNS	--	1.5E-06	--	1.5E-06								
	Exposure Point Total					7.1E-11													1.5E-06								
Exposure Medium Total - Group 2 Magazine Area						**1.4E-06**													**8.9E-03**								
Group 3	Site Soil	Arsenic	1.6E-06	--	5.4E-07	2.1E-06	NA				NA				Skin	9.8E-03	--	3.3E-03	1.3E-02	NA				NA			
	Exposure Point Total					2.1E-06													1.3E-02								
	Outdoor Air	Arsenic	--	1.0E-10	--	1.0E-10									Developmental, Cardiovascular, CNS	--	2.3E-06	--	2.3E-06								
	Exposure Point Total					1.0E-10													2.3E-06								
Exposure Medium Total - Group 3 Magazine Area						**2.1E-06**													**1.3E-02**								
Group 4	Site Soil	Arsenic	1.3E-06	--	4.4E-07	1.7E-06	NA				NA				Skin	8.0E-03	--	2.7E-03	1.1E-02	NA				NA			
	Exposure Point Total					1.7E-06													1.1E-02								
	Outdoor Air	Arsenic	--	8.5E-11	--	8.5E-11									Developmental, Cardiovascular, CNS	--	1.8E-06	--	1.8E-06								
	Exposure Point Total					8.5E-11													1.8E-06								
Exposure Medium Total - Group 4 Magazine Area						**1.7E-06**													**1.1E-02**								
Group 5	Site Soil	Arsenic	1.9E-06	--	6.4E-07	2.5E-06	NA				NA				Skin	1.2E-02	--	4.0E-03	1.6E-02	NA				NA			
	Exposure Point Total					2.5E-06													1.6E-02								
	Outdoor Air	Arsenic	--	1.2E-10	--	1.2E-10									Developmental, Cardiovascular, CNS	--	2.7E-06	--	2.7E-06								
	Exposure Point Total					1.2E-10													2.7E-06								
Exposure Medium Total - Group 5 Magazine Area						**2.5E-06**													**1.6E-02**								

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
NA	Not applicable - no complete exposure pathways for this depth interval for this receptor
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	4.1E-07	--	--	1.5E-06	--	--	2.3E-06	--	--	1.8E-06	--	--	2.7E-06	--	--
CNS	4.1E-07	--	--	1.5E-06	--	--	2.3E-06	--	--	1.8E-06	--	--	2.7E-06	--	--
Developmental	4.1E-07	--	--	1.5E-06	--	--	2.3E-06	--	--	1.8E-06	--	--	2.7E-06	--	--
Skin	2.4E-03	--	--	8.9E-03	--	--	1.3E-02	--	--	1.1E-02	--	--	1.6E-02	--	--

TABLE G1-7.1.2

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

				EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	1.5E+00	1.7E-06	2.5E-06	NE		1.7E-06	2.5E-06	3.0E-04	4.7E-06	1.6E-02	NE		4.7E-06	1.6E-02
		Dermal	Arsenic	4.8E+00		4.8E+00	1.5E+00	5.8E-07	8.6E-07			5.8E-07	8.6E-07	3.0E-04	1.6E-06	5.4E-03			1.6E-06	5.4E-03
	Exposure Point Total								3.4E-06				3.4E-06			2.1E-02				2.1E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.5E+01	1.8E-10	2.7E-09			1.8E-10	2.7E-09	8.6E-06	5.0E-10	5.8E-05			5.0E-10	5.8E-05
	Exposure Point Total								2.7E-09				2.7E-09			5.8E-05				5.8E-05
Exposure Medium Total - Group 1 Magazine Area									**3.4E-06**				**3.4E-06**			**2.1E-02**				**2.1E-02**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	6.4E-06	9.6E-06	1.7E-06	2.6E-06	5.8E-06	8.7E-06	3.0E-04	1.8E-05	6.0E-02	4.8E-06	1.6E-02	1.6E-05	5.4E-02
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	2.2E-06	3.3E-06	5.8E-07	8.8E-07	2.0E-06	3.0E-06	3.0E-04	6.1E-06	2.0E-02	1.6E-06	5.4E-03	5.6E-06	1.9E-02
	Exposure Point Total								1.3E-05		3.4E-06		1.2E-05			8.0E-02		2.1E-02		7.3E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+01	6.8E-10	1.0E-08	1.8E-10	2.7E-09	6.2E-10	9.3E-09	8.6E-06	1.9E-09	2.2E-04	5.1E-10	5.9E-05	1.7E-09	2.0E-04
	Exposure Point Total								1.0E-08		2.7E-09		9.3E-09			2.2E-04		5.9E-05		2.0E-04
Exposure Medium Total - Group 2 Magazine Area									**1.3E-05**		**3.4E-06**		**1.2E-05**			**8.0E-02**		**2.1E-02**		**7.3E-02**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	9.4E-06	1.4E-05	2.4E-06	3.6E-06	1.1E-05	1.6E-05	3.0E-04	2.6E-05	8.7E-02	6.7E-06	2.2E-02	3.0E-05	1.0E-01
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	3.2E-06	4.8E-06	8.1E-07	1.2E-06	3.7E-06	5.5E-06	3.0E-04	9.0E-06	3.0E-02	2.3E-06	7.6E-03	1.0E-05	3.4E-02
	Exposure Point Total								1.9E-05		4.8E-06		2.2E-05			1.2E-01		3.0E-02		1.3E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+01	9.9E-10	1.5E-08	2.5E-10	3.8E-09	1.1E-09	1.7E-08	8.6E-06	2.8E-09	3.2E-04	7.1E-10	8.2E-05	3.2E-09	3.7E-04
	Exposure Point Total								1.5E-08		3.8E-09		1.7E-08			3.2E-04		8.2E-05		3.7E-04
Exposure Medium Total - Group 3 Magazine Area									**1.9E-05**		**4.8E-06**		**2.2E-05**			**1.2E-01**		**3.0E-02**		**1.3E-01**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	7.6E-06	1.1E-05	1.4E-05	2.1E-05	7.4E-06	1.1E-05	3.0E-04	2.1E-05	7.1E-02	3.9E-05	1.3E-01	2.1E-05	6.9E-02
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	2.6E-06	3.9E-06	4.7E-06	7.1E-06	2.5E-06	3.8E-06	3.0E-04	7.3E-06	2.4E-02	1.3E-05	4.4E-02	7.1E-06	2.4E-02
	Exposure Point Total								1.5E-05		2.8E-05		1.5E-05			9.6E-02		1.7E-01		9.3E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+01	8.1E-10	1.2E-08	1.5E-09	2.2E-08	7.8E-10	1.2E-08	8.6E-06	2.3E-09	2.6E-04	4.1E-09	4.7E-04	2.2E-09	2.6E-04
	Exposure Point Total								1.2E-08		2.2E-08		1.2E-08			2.6E-04		4.7E-04		2.6E-04
Exposure Medium Total - Group 4 Magazine Area									**1.5E-05**		**2.8E-05**		**1.5E-05**			**9.6E-02**		**1.7E-01**		**9.3E-02**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	1.1E-05	1.7E-05	1.7E-06	2.6E-06	9.4E-06	1.4E-05	3.0E-04	3.1E-05	1.0E-01	4.9E-06	1.6E-02	2.6E-05	8.8E-02
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	3.8E-06	5.8E-06	5.9E-07	8.9E-07	3.2E-06	4.8E-06	3.0E-04	1.1E-05	3.6E-02	1.7E-06	5.5E-03	9.0E-06	3.0E-02
	Exposure Point Total								2.3E-05		3.5E-06		1.9E-05			1.4E-01		2.2E-02		1.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+01	1.2E-09	1.8E-08	1.8E-10	2.8E-09	1.0E-09	1.5E-08	8.6E-06	3.3E-09	3.9E-04	5.2E-10	6.0E-05	2.8E-09	3.2E-04
	Exposure Point Total								1.8E-08		2.8E-09		1.5E-08			3.9E-04		6.0E-05		3.2E-04
Exposure Medium Total - Group 5 Magazine Area									**2.3E-05**		**3.5E-06**		**1.9E-05**			**1.4E-01**		**2.2E-02**		**1.2E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	2.5E-06	--	8.6E-07	3.4E-06	NE				2.5E-06	--	8.6E-07	3.4E-06	Skin	1.6E-02	--	5.4E-03	2.1E-02	NE				1.6E-02	--	5.4E-03	2.1E-02
	Exposure Point Total					3.4E-06								3.4E-06					2.1E-02								2.1E-02
	Outdoor Air	Arsenic	--	2.7E-09	--	2.7E-09					--	2.7E-09	--	2.7E-09	Developmental, Cardiovascular, CNS	--	5.8E-05	--	5.8E-05					--	5.8E-05	--	5.8E-05
	Exposure Point Total					2.7E-09								2.7E-09					5.8E-05								5.8E-05
Exposure Medium Total - Group 1 Magazine Area						**3.4E-06**								**3.4E-06**					**2.1E-02**								**2.1E-02**
Group 2	Site Soil	Arsenic	9.6E-06	--	3.3E-06	1.3E-05	2.6E-06	--	8.8E-07	3.4E-06	8.7E-06	--	3.0E-06	1.2E-05	Skin	6.0E-02	--	2.0E-02	8.0E-02	1.6E-02	--	5.4E-03	2.1E-02	5.4E-02	--	1.9E-02	7.3E-02
	Exposure Point Total					1.3E-05				3.4E-06				1.2E-05					8.0E-02				2.1E-02				7.3E-02
	Outdoor Air	Arsenic	--	1.0E-08	--	1.0E-08	--	2.7E-09	--	2.7E-09	--	9.3E-09	--	9.3E-09	Developmental, Cardiovascular, CNS	--	2.2E-04	--	2.2E-04	--	5.9E-05	--	5.9E-05	--	2.0E-04	--	2.0E-04
	Exposure Point Total					1.0E-08				2.7E-09				9.3E-09					2.2E-04				5.9E-05				2.0E-04
Exposure Medium Total - Group 2 Magazine Area						**1.3E-05**				**3.4E-06**				**1.2E-05**					**8.0E-02**				**2.1E-02**				**7.3E-02**
Group 3	Site Soil	Arsenic	1.4E-05	--	4.8E-06	1.9E-05	3.6E-06	--	1.2E-06	4.8E-06	1.6E-05	--	5.5E-06	2.2E-05	Skin	8.7E-02	--	3.0E-02	1.2E-01	2.2E-02	--	7.6E-03	3.0E-02	1.0E-01	--	3.4E-02	1.3E-01
	Exposure Point Total					1.9E-05				4.8E-06				2.2E-05					1.2E-01				3.0E-02				1.3E-01
	Outdoor Air	Arsenic	--	1.5E-08	--	1.5E-08	--	3.8E-09	--	3.8E-09	--	1.7E-08	--	1.7E-08	Developmental, Cardiovascular, CNS	--	3.2E-04	--	3.2E-04	--	8.2E-05	--	8.2E-05	--	3.7E-04	--	3.7E-04
	Exposure Point Total					1.5E-08				3.8E-09				1.7E-08					3.2E-04				8.2E-05				3.7E-04
Exposure Medium Total - Group 3 Magazine Area						**1.9E-05**				**4.8E-06**				**2.2E-05**					**1.2E-01**				**3.0E-02**				**1.3E-01**
Group 4	Site Soil	Arsenic	1.1E-05	--	3.9E-06	1.5E-05	2.1E-05	--	7.1E-06	2.8E-05	1.1E-05	--	3.8E-06	1.5E-05	Skin	7.1E-02	--	2.4E-02	9.6E-02	1.3E-01	--	4.4E-02	1.7E-01	6.9E-02	--	2.4E-02	9.3E-02
	Exposure Point Total					1.5E-05				2.8E-05				1.5E-05					9.6E-02				1.7E-01				9.3E-02
	Outdoor Air	Arsenic	--	1.2E-08	--	1.2E-08	--	2.2E-08	--	2.2E-08	--	1.2E-08	--	1.2E-08	Developmental, Cardiovascular, CNS	--	2.6E-04	--	2.6E-04	--	4.7E-04	--	4.7E-04	--	2.6E-04	--	2.6E-04
	Exposure Point Total					1.2E-08				2.2E-08				1.2E-08					2.6E-04				4.7E-04				2.6E-04
Exposure Medium Total - Group 4 Magazine Area						**1.5E-05**				**2.8E-05**				**1.5E-05**					**9.6E-02**				**1.7E-01**				**9.3E-02**
Group 5	Site Soil	Arsenic	1.7E-05	--	5.8E-06	2.3E-05	2.6E-06	--	8.9E-07	3.5E-06	1.4E-05	--	4.8E-06	1.9E-05	Skin	1.0E-01	--	3.6E-02	1.4E-01	1.6E-02	--	5.5E-03	2.2E-02	8.8E-02	--	3.0E-02	1.2E-01
	Exposure Point Total					2.3E-05				3.5E-06				1.9E-05					1.4E-01				2.2E-02				1.2E-01
	Outdoor Air	Arsenic	--	1.8E-08	--	1.8E-08	--	2.8E-09	--	2.8E-09	--	1.5E-08	--	1.5E-08	Developmental, Cardiovascular, CNS	--	3.9E-04	--	3.9E-04	--	6.0E-05	--	6.0E-05	--	3.2E-04	--	3.2E-04
	Exposure Point Total					1.8E-08				2.8E-09				1.5E-08					3.9E-04				6.0E-05				3.2E-04
Exposure Medium Total - Group 5 Magazine Area						**2.3E-05**				**3.5E-06**				**1.9E-05**					**1.4E-01**				**2.2E-02**				**1.2E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	5.8E-05	--	5.8E-05	2.2E-04	5.9E-05	2.0E-04	3.2E-04	8.2E-05	3.7E-04	2.6E-04	4.7E-04	2.6E-04	3.9E-04	6.0E-05	3.2E-04
CNS	5.8E-05	--	5.8E-05	2.2E-04	5.9E-05	2.0E-04	3.2E-04	8.2E-05	3.7E-04	2.6E-04	4.7E-04	2.6E-04	3.9E-04	6.0E-05	3.2E-04
Developmental	5.8E-05	--	5.8E-05	2.2E-04	5.9E-05	2.0E-04	3.2E-04	8.2E-05	3.7E-04	2.6E-04	4.7E-04	2.6E-04	3.9E-04	6.0E-05	3.2E-04
Skin	2.1E-02	--	2.1E-02	8.0E-02	2.1E-02	7.3E-02	1.2E-01	3.0E-02	1.3E-01	9.6E-02	1.7E-01	9.3E-02	1.4E-01	2.2E-02	1.2E-01

TABLE G1-7.1.3

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	1.5E+00	8.0E-08	1.2E-07	NE		8.0E-08	1.2E-07	3.0E-04	5.6E-06	1.9E-02	NE		5.6E-06	1.9E-02
		Dermal	Arsenic	4.8E+00		4.8E+00	1.5E+00	3.3E-08	5.0E-08			3.3E-08	5.0E-08	3.0E-04	2.3E-06	7.7E-03			2.3E-06	7.7E-03
	Exposure Point Total								1.7E-07				1.7E-07			2.6E-02				2.6E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.5E+01	4.8E-09	7.3E-08			4.8E-09	7.3E-08	8.6E-06	3.4E-07	3.9E-02			3.4E-07	3.9E-02
	Exposure Point Total								7.3E-08				7.3E-08			3.9E-02				3.9E-02
Exposure Medium Total - Group 1 Magazine Area									**2.4E-07**				**2.4E-07**			**6.6E-02**				**6.6E-02**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	3.0E-07	4.5E-07	8.1E-08	1.2E-07	2.8E-07	4.2E-07	3.0E-04	2.1E-05	7.1E-02	5.7E-06	1.9E-02	1.9E-05	6.5E-02
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	1.3E-07	1.9E-07	3.4E-08	5.0E-08	1.1E-07	1.7E-07	3.0E-04	8.8E-06	2.9E-02	2.4E-06	7.8E-03	8.0E-06	2.7E-02
	Exposure Point Total								6.4E-07		1.7E-07		5.9E-07			1.0E-01		2.7E-02		9.1E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+01	1.8E-08	2.8E-07	4.9E-09	7.4E-08	1.7E-08	2.5E-07	8.6E-06	1.3E-06	1.5E-01	3.4E-07	4.0E-02	1.2E-06	1.4E-01
	Exposure Point Total								2.8E-07		7.4E-08		2.5E-07			1.5E-01		4.0E-02		1.4E-01
Exposure Medium Total - Group 2 Magazine Area									**9.2E-07**		**2.5E-07**		**8.4E-07**			**2.5E-01**		**6.7E-02**		**2.3E-01**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	4.5E-07	6.7E-07	1.1E-07	1.7E-07	5.1E-07	7.6E-07	3.0E-04	3.1E-05	1.0E-01	7.9E-06	2.6E-02	3.6E-05	1.2E-01
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	1.8E-07	2.8E-07	4.7E-08	7.0E-08	2.1E-07	3.2E-07	3.0E-04	1.3E-05	4.3E-02	3.3E-06	1.1E-02	1.5E-05	4.9E-02
	Exposure Point Total								9.4E-07		2.4E-07		1.1E-06			1.5E-01		3.7E-02		1.7E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+01	2.7E-08	4.0E-07	6.9E-09	1.0E-07	3.1E-08	4.6E-07	8.6E-06	1.9E-06	2.2E-01	4.8E-07	5.6E-02	2.2E-06	2.5E-01
	Exposure Point Total								4.0E-07		1.0E-07		4.6E-07			2.2E-01		5.6E-02		2.5E-01
Exposure Medium Total - Group 3 Magazine Area									**1.3E-06**		**3.4E-07**		**1.5E-06**			**3.7E-01**		**9.3E-02**		**4.2E-01**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	3.6E-07	5.5E-07	6.5E-07	9.8E-07	3.5E-07	5.3E-07	3.0E-04	2.5E-05	8.5E-02	4.6E-05	1.5E-01	2.5E-05	8.2E-02
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	1.5E-07	2.3E-07	2.7E-07	4.1E-07	1.5E-07	2.2E-07	3.0E-04	1.1E-05	3.5E-02	1.9E-05	6.3E-02	1.0E-05	3.4E-02
	Exposure Point Total								7.7E-07		1.4E-06		7.5E-07			1.2E-01		2.2E-01		1.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+01	2.2E-08	3.3E-07	4.0E-08	5.9E-07	2.1E-08	3.2E-07	8.6E-06	1.5E-06	1.8E-01	2.8E-06	3.2E-01	1.5E-06	1.7E-01
	Exposure Point Total								3.3E-07		5.9E-07		3.2E-07			1.8E-01		3.2E-01		1.7E-01
Exposure Medium Total - Group 4 Magazine Area									**1.1E-06**		**2.0E-06**		**1.1E-06**			**3.0E-01**		**5.4E-01**		**2.9E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	5.3E-07	8.0E-07	8.3E-08	1.2E-07	4.5E-07	6.7E-07	3.0E-04	3.7E-05	1.2E-01	5.8E-06	1.9E-02	3.1E-05	1.0E-01
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	2.2E-07	3.3E-07	3.4E-08	5.1E-08	1.9E-07	2.8E-07	3.0E-04	1.5E-05	5.2E-02	2.4E-06	8.0E-03	1.3E-05	4.3E-02
	Exposure Point Total								1.1E-06		1.8E-07		9.5E-07			1.8E-01		2.7E-02		1.5E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+01	3.2E-08	4.8E-07	5.0E-09	7.5E-08	2.7E-08	4.1E-07	8.6E-06	2.3E-06	2.6E-01	3.5E-07	4.1E-02	1.9E-06	2.2E-01
	Exposure Point Total								4.8E-07		7.5E-08		4.1E-07			2.6E-01		4.1E-02		2.2E-01
Exposure Medium Total - Group 5 Magazine Area									**1.6E-06**		**2.5E-07**		**1.4E-06**			**4.4E-01**		**6.8E-02**		**3.7E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.1.3

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investiation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	1.2E-07	--	5.0E-08	1.7E-07	NE				1.2E-07	--	5.0E-08	1.7E-07	Skin	1.9E-02	--	7.7E-03	2.6E-02	NE				1.9E-02	--	7.7E-03	2.6E-02
	Exposure Point Total					1.7E-07								1.7E-07					2.6E-02								2.6E-02
	Outdoor Air	Arsenic	--	7.3E-08	--	7.3E-08					--	7.3E-08	--	7.3E-08	Developmental, Cardiovascular, CNS	--	3.9E-02	--	3.9E-02					--	3.9E-02	--	3.9E-02
	Exposure Point Total					7.3E-08								7.3E-08					3.9E-02								3.9E-02
Exposure Medium Total - Group 1 Magazine Area						**2.4E-07**								**2.4E-07**					**6.6E-02**								**6.6E-02**
Group 2	Site Soil	Arsenic	4.5E-07	--	1.9E-07	6.4E-07	1.2E-07	--	5.0E-08	1.7E-07	4.2E-07	--	1.7E-07	5.9E-07	Skin	7.1E-02	--	2.9E-02	1.0E-01	1.9E-02	--	7.8E-03	2.7E-02	6.5E-02	--	2.7E-02	9.1E-02
	Exposure Point Total					6.4E-07				1.7E-07				5.9E-07					1.0E-01				2.7E-02				9.1E-02
	Outdoor Air	Arsenic	--	2.8E-07	--	2.8E-07	--	7.4E-08	--	7.4E-08	--	2.5E-07	--	2.5E-07	Developmental, Cardiovascular, CNS	--	1.5E-01	--	1.5E-01	--	4.0E-02	--	4.0E-02	--	1.4E-01	--	1.4E-01
	Exposure Point Total					2.8E-07				7.4E-08				2.5E-07					1.5E-01				4.0E-02				1.4E-01
Exposure Medium Total - Group 2 Magazine Area						**9.2E-07**				**2.5E-07**				**8.4E-07**					**2.5E-01**				**6.7E-02**				**2.3E-01**
Group 3	Site Soil	Arsenic	6.7E-07	--	2.8E-07	9.4E-07	1.7E-07	--	7.0E-08	2.4E-07	7.6E-07	--	3.2E-07	1.1E-06	Skin	1.0E-01	--	4.3E-02	1.5E-01	2.6E-02	--	1.1E-02	3.7E-02	1.2E-01	--	4.9E-02	1.7E-01
	Exposure Point Total					9.4E-07				2.4E-07				1.1E-06					1.5E-01				3.7E-02				1.7E-01
	Outdoor Air	Arsenic	--	4.0E-07	--	4.0E-07	--	1.0E-07	--	1.0E-07	--	4.6E-07	--	4.6E-07	Developmental, Cardiovascular, CNS	--	2.2E-01	--	2.2E-01	--	5.6E-02	--	5.6E-02	--	2.5E-01	--	2.5E-01
	Exposure Point Total					4.0E-07				1.0E-07				4.6E-07					2.2E-01				5.6E-02				2.5E-01
Exposure Medium Total - Group 3 Magazine Area						**1.3E-06**				**3.4E-07**				**1.5E-06**					**3.7E-01**				**9.3E-02**				**4.2E-01**
Group 4	Site Soil	Arsenic	5.5E-07	--	2.3E-07	7.7E-07	9.8E-07	--	4.1E-07	1.4E-06	5.3E-07	--	2.2E-07	7.5E-07	Skin	8.5E-02	--	3.5E-02	1.2E-01	1.5E-01	--	6.3E-02	2.2E-01	8.2E-02	--	3.4E-02	1.2E-01
	Exposure Point Total					7.7E-07				1.4E-06				7.5E-07					1.2E-01				2.2E-01				1.2E-01
	Outdoor Air	Arsenic	--	3.3E-07	--	3.3E-07	--	5.9E-07	--	5.9E-07	--	3.2E-07	--	3.2E-07	Developmental, Cardiovascular, CNS	--	1.8E-01	--	1.8E-01	--	3.2E-01	--	3.2E-01	--	1.7E-01	--	1.7E-01
	Exposure Point Total					3.3E-07				5.9E-07				3.2E-07					1.8E-01				3.2E-01				1.7E-01
Exposure Medium Total - Group 4 Magazine Area						**1.1E-06**				**2.0E-06**				**1.1E-06**					**3.0E-01**				**5.4E-01**				**2.9E-01**
Group 5	Site Soil	Arsenic	8.0E-07	--	3.3E-07	1.1E-06	1.2E-07	--	5.1E-08	1.8E-07	6.7E-07	--	2.8E-07	9.5E-07	Skin	1.2E-01	--	5.2E-02	1.8E-01	1.9E-02	--	8.0E-03	2.7E-02	1.0E-01	--	4.3E-02	1.5E-01
	Exposure Point Total					1.1E-06				1.8E-07				9.5E-07					1.8E-01				2.7E-02				1.5E-01
	Outdoor Air	Arsenic	--	4.8E-07	--	4.8E-07	--	7.5E-08	--	7.5E-08	--	4.1E-07	--	4.1E-07	Developmental, Cardiovascular, CNS	--	2.6E-01	--	2.6E-01	--	4.1E-02	--	4.1E-02	--	2.2E-01	--	2.2E-01
	Exposure Point Total					4.8E-07				7.5E-08				4.1E-07					2.6E-01				4.1E-02				2.2E-01
Exposure Medium Total - Group 5 Magazine Area						**1.6E-06**				**2.5E-07**				**1.4E-06**					**4.4E-01**				**6.8E-02**				**3.7E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	3.9E-02	--	3.9E-02	1.5E-01	4.0E-02	1.4E-01	2.2E-01	5.6E-02	2.5E-01	1.8E-01	3.2E-01	1.7E-01	2.6E-01	4.1E-02	2.2E-01
CNS	3.9E-02	--	3.9E-02	1.5E-01	4.0E-02	1.4E-01	2.2E-01	5.6E-02	2.5E-01	1.8E-01	3.2E-01	1.7E-01	2.6E-01	4.1E-02	2.2E-01
Developmental	3.9E-02	--	3.9E-02	1.5E-01	4.0E-02	1.4E-01	2.2E-01	5.6E-02	2.5E-01	1.8E-01	3.2E-01	1.7E-01	2.6E-01	4.1E-02	2.2E-01
Skin	2.6E-02	--	2.6E-02	1.0E-01	2.7E-02	9.1E-02	1.5E-01	3.7E-02	1.7E-01	1.2E-01	2.2E-01	1.2E-01	1.8E-01	2.7E-02	1.5E-01

TABLE G1-7.1.4

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	1.5E+00	2.3E-06	3.4E-06	NE		2.3E-06	3.4E-06	3.0E-04	6.6E-06	2.2E-02	NE		6.6E-06	2.2E-02
		Dermal	Arsenic	4.8E+00		4.8E+00	1.5E+00	2.7E-07	4.1E-07			2.7E-07	4.1E-07	3.0E-04	7.9E-07	2.6E-03			7.9E-07	2.6E-03
	Exposure Point Total								3.8E-06				3.8E-06			2.5E-02				2.5E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.5E+01	3.4E-10	5.1E-09			3.4E-10	5.1E-09	8.6E-06	1.0E-09	1.2E-04			1.0E-09	1.2E-04
	Exposure Point Total								5.1E-09				5.1E-09			1.2E-04				1.2E-04
Exposure Medium Total - Group 1 Magazine Area									**3.8E-06**				**3.8E-06**			**2.5E-02**				**2.5E-02**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	8.6E-06	1.3E-05	2.3E-06	3.4E-06	7.8E-06	1.2E-05	3.0E-04	2.5E-05	8.3E-02	6.7E-06	2.2E-02	2.3E-05	7.6E-02
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	1.0E-06	1.5E-06	2.7E-07	4.1E-07	9.4E-07	1.4E-06	3.0E-04	3.0E-06	1.0E-02	8.0E-07	2.7E-03	2.7E-06	9.1E-03
	Exposure Point Total								1.4E-05		3.9E-06		1.3E-05			9.3E-02		2.5E-02		8.5E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+01	1.3E-09	1.9E-08	3.5E-10	5.2E-09	1.2E-09	1.8E-08	8.6E-06	3.8E-09	4.4E-04	1.0E-09	1.2E-04	3.5E-09	4.0E-04
	Exposure Point Total								1.9E-08		5.2E-09		1.8E-08			4.4E-04		1.2E-04		4.0E-04
Exposure Medium Total - Group 2 Magazine Area									**1.4E-05**		**3.9E-06**		**1.3E-05**			**9.4E-02**		**2.5E-02**		**8.6E-02**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	1.3E-05	1.9E-05	3.2E-06	4.8E-06	1.4E-05	2.2E-05	3.0E-04	3.7E-05	1.2E-01	9.3E-06	3.1E-02	4.2E-05	1.4E-01
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	1.5E-06	2.3E-06	3.8E-07	5.7E-07	1.7E-06	2.6E-06	3.0E-04	4.4E-06	1.5E-02	1.1E-06	3.7E-03	5.0E-06	1.7E-02
	Exposure Point Total								2.1E-05		5.4E-06		2.4E-05			1.4E-01		3.5E-02		1.6E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+01	1.9E-09	2.9E-08	4.8E-10	7.3E-09	2.2E-09	3.3E-08	8.6E-06	5.6E-09	6.5E-04	1.4E-09	1.6E-04	6.4E-09	7.4E-04
	Exposure Point Total								2.9E-08		7.3E-09		3.3E-08			6.5E-04		1.6E-04		7.4E-04
Exposure Medium Total - Group 3 Magazine Area									**2.1E-05**		**5.4E-06**		**2.4E-05**			**1.4E-01**		**3.5E-02**		**1.6E-01**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	1.0E-05	1.5E-05	1.8E-05	2.8E-05	9.9E-06	1.5E-05	3.0E-04	3.0E-05	1.0E-01	5.4E-05	1.8E-01	2.9E-05	9.7E-02
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	1.2E-06	1.8E-06	2.2E-06	3.3E-06	1.2E-06	1.8E-06	3.0E-04	3.6E-06	1.2E-02	6.5E-06	2.2E-02	3.5E-06	1.2E-02
	Exposure Point Total								1.7E-05		3.1E-05		1.7E-05			1.1E-01		2.0E-01		1.1E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+01	1.6E-09	2.3E-08	2.8E-09	4.2E-08	1.5E-09	2.3E-08	8.6E-06	4.5E-09	5.3E-04	8.2E-09	9.5E-04	4.4E-09	5.1E-04
	Exposure Point Total								2.3E-08		4.2E-08		2.3E-08			5.3E-04		9.5E-04		5.1E-04
Exposure Medium Total - Group 4 Magazine Area									**1.7E-05**		**3.1E-05**		**1.7E-05**			**1.1E-01**		**2.0E-01**		**1.1E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	1.5E-05	2.3E-05	2.3E-06	3.5E-06	1.3E-05	1.9E-05	3.0E-04	4.4E-05	1.5E-01	6.8E-06	2.3E-02	3.7E-05	1.2E-01
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	1.8E-06	2.7E-06	2.8E-07	4.2E-07	1.5E-06	2.3E-06	3.0E-04	5.3E-06	1.8E-02	8.2E-07	2.7E-03	4.4E-06	1.5E-02
	Exposure Point Total								2.5E-05		3.9E-06		2.1E-05			1.6E-01		2.5E-02		1.4E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+01	2.3E-09	3.4E-08	3.5E-10	5.3E-09	1.9E-09	2.9E-08	8.6E-06	6.7E-09	7.7E-04	1.0E-09	1.2E-04	5.6E-09	6.5E-04
	Exposure Point Total								3.4E-08		5.3E-09		2.9E-08			7.7E-04		1.2E-04		6.5E-04
Exposure Medium Total - Group 5 Magazine Area									**2.5E-05**		**3.9E-06**		**2.1E-05**			**1.6E-01**		**2.6E-02**		**1.4E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.1.4

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	3.4E-06	--	4.1E-07	3.8E-06	NE				3.4E-06	--	4.1E-07	3.8E-06	Skin	2.2E-02	--	2.6E-03	2.5E-02	NE				2.2E-02	--	2.6E-03	2.5E-02
	Exposure Point Total					3.8E-06								3.8E-06					2.5E-02								2.5E-02
	Outdoor Air	Arsenic	--	5.1E-09	--	5.1E-09					--	5.1E-09	--	5.1E-09	Developmental, Cardiovascular, CNS	--	1.2E-04	--	1.2E-04					--	1.2E-04	--	1.2E-04
	Exposure Point Total					5.1E-09								5.1E-09					1.2E-04								1.2E-04
Exposure Medium Total - Group 1 Magazine Area						**3.8E-06**								**3.8E-06**					**2.5E-02**								**2.5E-02**
Group 2	Site Soil	Arsenic	1.3E-05	--	1.5E-06	1.4E-05	3.4E-06	--	4.1E-07	3.9E-06	1.2E-05	--	1.4E-06	1.3E-05	Skin	8.3E-02	--	1.0E-02	9.3E-02	2.2E-02	--	2.7E-03	2.5E-02	7.6E-02	--	9.1E-03	8.5E-02
	Exposure Point Total					1.4E-05				3.9E-06				1.3E-05					9.3E-02				2.5E-02				8.5E-02
	Outdoor Air	Arsenic	--	1.9E-08	--	1.9E-08	--	5.2E-09	--	5.2E-09	--	1.8E-08	--	1.8E-08	Developmental, Cardiovascular, CNS	--	4.4E-04	--	4.4E-04	--	1.2E-04	--	1.2E-04	--	4.0E-04	--	4.0E-04
	Exposure Point Total					1.9E-08				5.2E-09				1.8E-08					4.4E-04				1.2E-04				4.0E-04
Exposure Medium Total - Group 2 Magazine Area						**1.4E-05**				**3.9E-06**				**1.3E-05**					**9.4E-02**				**2.5E-02**				**8.6E-02**
Group 3	Site Soil	Arsenic	1.9E-05	--	2.3E-06	2.1E-05	4.8E-06	--	5.7E-07	5.4E-06	2.2E-05	--	2.6E-06	2.4E-05	Skin	1.2E-01	--	1.5E-02	1.4E-01	3.1E-02	--	3.7E-03	3.5E-02	1.4E-01	--	1.7E-02	1.6E-01
	Exposure Point Total					2.1E-05				5.4E-06				2.4E-05					1.4E-01				3.5E-02				1.6E-01
	Outdoor Air	Arsenic	--	2.9E-08	--	2.9E-08	--	7.3E-09	--	7.3E-09	--	3.3E-08	--	3.3E-08	Developmental, Cardiovascular, CNS	--	6.5E-04	--	6.5E-04	--	1.6E-04	--	1.6E-04	--	7.4E-04	--	7.4E-04
	Exposure Point Total					2.9E-08				7.3E-09				3.3E-08					6.5E-04				1.6E-04				7.4E-04
Exposure Medium Total - Group 3 Magazine Area						**2.1E-05**				**5.4E-06**				**2.4E-05**					**1.4E-01**				**3.5E-02**				**1.6E-01**
Group 4	Site Soil	Arsenic	1.5E-05	--	1.8E-06	1.7E-05	2.8E-05	--	3.3E-06	3.1E-05	1.5E-05	--	1.8E-06	1.7E-05	Skin	1.0E-01	--	1.2E-02	1.1E-01	1.8E-01	--	2.2E-02	2.0E-01	9.7E-02	--	1.2E-02	1.1E-01
	Exposure Point Total					1.7E-05				3.1E-05				1.7E-05					1.1E-01				2.0E-01				1.1E-01
	Outdoor Air	Arsenic	--	2.3E-08	--	2.3E-08	--	4.2E-08	--	4.2E-08	--	2.3E-08	--	2.3E-08	Developmental, Cardiovascular, CNS	--	5.3E-04	--	5.3E-04	--	9.5E-04	--	9.5E-04	--	5.1E-04	--	5.1E-04
	Exposure Point Total					2.3E-08				4.2E-08				2.3E-08					5.3E-04				9.5E-04				5.1E-04
Exposure Medium Total - Group 4 Magazine Area						**1.7E-05**				**3.1E-05**				**1.7E-05**					**1.1E-01**				**2.0E-01**				**1.1E-01**
Group 5	Site Soil	Arsenic	2.3E-05	--	2.7E-06	2.5E-05	3.5E-06	--	4.2E-07	3.9E-06	1.9E-05	--	2.3E-06	2.1E-05	Skin	1.5E-01	--	1.8E-02	1.6E-01	2.3E-02	--	2.7E-03	2.5E-02	1.2E-01	--	1.5E-02	1.4E-01
	Exposure Point Total					2.5E-05				3.9E-06				2.1E-05					1.6E-01				2.5E-02				1.4E-01
	Outdoor Air	Arsenic	--	3.4E-08	--	3.4E-08	--	5.3E-09	--	5.3E-09	--	2.9E-08	--	2.9E-08	Developmental, Cardiovascular, CNS	--	7.7E-04	--	7.7E-04	--	1.2E-04	--	1.2E-04	--	6.5E-04	--	6.5E-04
	Exposure Point Total					3.4E-08				5.3E-09				2.9E-08					7.7E-04				1.2E-04				6.5E-04
Exposure Medium Total - Group 5 Magazine Area						**2.5E-05**				**3.9E-06**				**2.1E-05**					**1.6E-01**				**2.6E-02**				**1.4E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	1.2E-04	--	1.2E-04	4.4E-04	1.2E-04	4.0E-04	6.5E-04	1.6E-04	7.4E-04	5.3E-04	9.5E-04	5.1E-04	7.7E-04	1.2E-04	6.5E-04
CNS	1.2E-04	--	1.2E-04	4.4E-04	1.2E-04	4.0E-04	6.5E-04	1.6E-04	7.4E-04	5.3E-04	9.5E-04	5.1E-04	7.7E-04	1.2E-04	6.5E-04
Developmental	1.2E-04	--	1.2E-04	4.4E-04	1.2E-04	4.0E-04	6.5E-04	1.6E-04	7.4E-04	5.3E-04	9.5E-04	5.1E-04	7.7E-04	1.2E-04	6.5E-04
Skin	2.5E-02	--	2.5E-02	9.3E-02	2.5E-02	8.5E-02	1.4E-01	3.5E-02	1.6E-01	1.1E-01	2.0E-01	1.1E-01	1.6E-01	2.5E-02	1.4E-01

TABLE G1-7.1.5

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	1.5E+00	5.3E-06	7.9E-06	NE		5.3E-06	7.9E-06	3.0E-04	6.2E-05	2.1E-01	NE		6.2E-05	2.1E-01
		Dermal	Arsenic	4.8E+00		4.8E+00	1.5E+00	4.6E-07	6.9E-07			4.6E-07	6.9E-07	3.0E-04	5.4E-06	1.8E-02			5.4E-06	1.8E-02
	Exposure Point Total								8.6E-06				8.6E-06			2.2E-01				2.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.5E+01	2.0E-10	3.0E-09			2.0E-10	3.0E-09	8.6E-06	2.3E-09	2.7E-04			2.3E-09	2.7E-04
	Exposure Point Total								3.0E-09				3.0E-09			2.7E-04				2.7E-04
Exposure Medium Total - Group 1 Magazine Area									**8.6E-06**				**8.6E-06**			**2.2E-01**				**2.2E-01**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	2.0E-05	3.0E-05	5.4E-06	8.0E-06	1.8E-05	2.7E-05	3.0E-04	2.3E-04	7.8E-01	6.2E-05	2.1E-01	2.1E-04	7.1E-01
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	1.7E-06	2.6E-06	4.7E-07	7.0E-07	1.6E-06	2.4E-06	3.0E-04	2.0E-05	6.8E-02	5.4E-06	1.8E-02	1.9E-05	6.2E-02
	Exposure Point Total								3.3E-05		8.7E-06		3.0E-05			8.5E-01		2.3E-01		7.7E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+01	7.6E-10	1.1E-08	2.0E-10	3.0E-09	6.9E-10	1.0E-08	8.6E-06	8.8E-09	1.0E-03	2.4E-09	2.7E-04	8.1E-09	9.4E-04
	Exposure Point Total								1.1E-08		3.0E-09		1.0E-08			1.0E-03		2.7E-04		9.4E-04
Exposure Medium Total - Group 2 Magazine Area									**3.3E-05**		**8.7E-06**		**3.0E-05**			**8.5E-01**		**2.3E-01**		**7.7E-01**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	2.9E-05	4.4E-05	7.5E-06	1.1E-05	3.4E-05	5.0E-05	3.0E-04	3.4E-04	1.1E+00	8.7E-05	2.9E-01	3.9E-04	1.3E+00
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	2.6E-06	3.8E-06	6.5E-07	9.7E-07	2.9E-06	4.4E-06	3.0E-04	3.0E-05	9.9E-02	7.6E-06	2.5E-02	3.4E-05	1.1E-01
	Exposure Point Total								4.8E-05		1.2E-05		5.5E-05			1.2E+00		3.2E-01		1.4E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+01	1.1E-09	1.7E-08	2.8E-10	4.2E-09	1.3E-09	1.9E-08	8.6E-06	1.3E-08	1.5E-03	3.3E-09	3.8E-04	1.5E-08	1.7E-03
	Exposure Point Total								1.7E-08		4.2E-09		1.9E-08			1.5E-03		3.8E-04		1.7E-03
Exposure Medium Total - Group 3 Magazine Area									**4.8E-05**		**1.2E-05**		**5.5E-05**			**1.2E+00**		**3.2E-01**		**1.4E+00**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	2.4E-05	3.6E-05	4.3E-05	6.5E-05	2.3E-05	3.5E-05	3.0E-04	2.8E-04	9.3E-01	5.0E-04	1.7E+00	2.7E-04	9.0E-01
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	2.1E-06	3.1E-06	3.8E-06	5.6E-06	2.0E-06	3.0E-06	3.0E-04	2.4E-05	8.1E-02	4.4E-05	1.5E-01	2.4E-05	7.8E-02
	Exposure Point Total								3.9E-05		7.0E-05		3.8E-05			1.0E+00		1.8E+00		9.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+01	9.1E-10	1.4E-08	1.6E-09	2.5E-08	8.8E-10	1.3E-08	8.6E-06	1.1E-08	1.2E-03	1.9E-08	2.2E-03	1.0E-08	1.2E-03
	Exposure Point Total								1.4E-08		2.5E-08		1.3E-08			1.2E-03		2.2E-03		1.2E-03
Exposure Medium Total - Group 4 Magazine Area									**3.9E-05**		**7.0E-05**		**3.8E-05**			**1.0E+00**		**1.8E+00**		**9.8E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	3.5E-05	5.3E-05	5.5E-06	8.2E-06	2.9E-05	4.4E-05	3.0E-04	4.1E-04	1.4E+00	6.4E-05	2.1E-01	3.4E-04	1.1E+00
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	3.1E-06	4.6E-06	4.7E-07	7.1E-07	2.6E-06	3.8E-06	3.0E-04	3.6E-05	1.2E-01	5.5E-06	1.8E-02	3.0E-05	1.0E-01
	Exposure Point Total								5.7E-05		8.9E-06		4.8E-05			1.5E+00		2.3E-01		1.2E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+01	1.3E-09	2.0E-08	2.1E-10	3.1E-09	1.1E-09	1.7E-08	8.6E-06	1.6E-08	1.8E-03	2.4E-09	2.8E-04	1.3E-08	1.5E-03
	Exposure Point Total								2.0E-08		3.1E-09		1.7E-08			1.8E-03		2.8E-04		1.5E-03
Exposure Medium Total - Group 5 Magazine Area									**5.7E-05**		**8.9E-06**		**4.8E-05**			**1.5E+00**		**2.3E-01**		**1.2E+00**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.1.5

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	7.9E-06	--	6.9E-07	8.6E-06	NE				7.9E-06	--	6.9E-07	8.6E-06	Skin	2.1E-01	--	1.8E-02	2.2E-01	NE				2.1E-01	--	1.8E-02	2.2E-01
	Exposure Point Total					8.6E-06								8.6E-06					2.2E-01								2.2E-01
	Outdoor Air	Arsenic	--	3.0E-09	--	3.0E-09					--	3.0E-09	--	3.0E-09	Developmental, Cardiovascular, CNS	--	2.7E-04	--	2.7E-04					--	2.7E-04	--	2.7E-04
	Exposure Point Total					3.0E-09								3.0E-09					2.7E-04								2.7E-04
Exposure Medium Total - Group 1 Magazine Area						**8.6E-06**								**8.6E-06**					**2.2E-01**								**2.2E-01**
Group 2	Site Soil	Arsenic	3.0E-05	--	2.6E-06	3.3E-05	8.0E-06	--	7.0E-07	8.7E-06	2.7E-05	--	2.4E-06	3.0E-05	Skin	7.8E-01	--	6.8E-02	8.5E-01	2.1E-01	--	1.8E-02	2.3E-01	7.1E-01	--	6.2E-02	7.7E-01
	Exposure Point Total					3.3E-05				8.7E-06				3.0E-05					8.5E-01				2.3E-01				7.7E-01
	Outdoor Air	Arsenic	--	1.1E-08	--	1.1E-08	--	3.0E-09	--	3.0E-09	--	1.0E-08	--	1.0E-08	Developmental, Cardiovascular, CNS	--	1.0E-03	--	1.0E-03	--	2.7E-04	--	2.7E-04	--	9.4E-04	--	9.4E-04
	Exposure Point Total					1.1E-08				3.0E-09				1.0E-08					1.0E-03				2.7E-04				9.4E-04
Exposure Medium Total - Group 2 Magazine Area						**3.3E-05**				**8.7E-06**				**3.0E-05**					**8.5E-01**				**2.3E-01**				**7.7E-01**
Group 3	Site Soil	Arsenic	4.4E-05	--	3.8E-06	4.8E-05	1.1E-05	--	9.7E-07	1.2E-05	5.0E-05	--	4.4E-06	5.5E-05	Skin	1.1E+00	--	9.9E-02	1.2E+00	2.9E-01	--	2.5E-02	3.2E-01	1.3E+00	--	1.1E-01	1.4E+00
	Exposure Point Total					4.8E-05				1.2E-05				5.5E-05					1.2E+00				3.2E-01				1.4E+00
	Outdoor Air	Arsenic	--	1.7E-08	--	1.7E-08	--	4.2E-09	--	4.2E-09	--	1.9E-08	--	1.9E-08	Developmental, Cardiovascular, CNS	--	1.5E-03	--	1.5E-03	--	3.8E-04	--	3.8E-04	--	1.7E-03	--	1.7E-03
	Exposure Point Total					1.7E-08				4.2E-09				1.9E-08					1.5E-03				3.8E-04				1.7E-03
Exposure Medium Total - Group 3 Magazine Area						**4.8E-05**				**1.2E-05**				**5.5E-05**					**1.2E+00**				**3.2E-01**				**1.4E+00**
Group 4	Site Soil	Arsenic	3.6E-05	--	3.1E-06	3.9E-05	6.5E-05	--	5.6E-06	7.0E-05	3.5E-05	--	3.0E-06	3.8E-05	Skin	9.3E-01	--	8.1E-02	1.0E+00	1.7E+00	--	1.5E-01	1.8E+00	9.0E-01	--	7.8E-02	9.8E-01
	Exposure Point Total					3.9E-05				7.0E-05				3.8E-05					1.0E+00				1.8E+00				9.8E-01
	Outdoor Air	Arsenic	--	1.4E-08	--	1.4E-08	--	2.5E-08	--	2.5E-08	--	1.3E-08	--	1.3E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03	--	2.2E-03	--	2.2E-03	--	1.2E-03	--	1.2E-03
	Exposure Point Total					1.4E-08				2.5E-08				1.3E-08					1.2E-03				2.2E-03				1.2E-03
Exposure Medium Total - Group 4 Magazine Area						**3.9E-05**				**7.0E-05**				**3.8E-05**					**1.0E+00**				**1.8E+00**				**9.8E-01**
Group 5	Site Soil	Arsenic	5.3E-05	--	4.6E-06	5.7E-05	8.2E-06	--	7.1E-07	8.9E-06	4.4E-05	--	3.8E-06	4.8E-05	Skin	1.4E+00	--	1.2E-01	1.5E+00	2.1E-01	--	1.8E-02	2.3E-01	1.1E+00	--	1.0E-01	1.2E+00
	Exposure Point Total					5.7E-05				8.9E-06				4.8E-05					1.5E+00				2.3E-01				1.2E+00
	Outdoor Air	Arsenic	--	2.0E-08	--	2.0E-08	--	3.1E-09	--	3.1E-09	--	1.7E-08	--	1.7E-08	Developmental, Cardiovascular, CNS	--	1.8E-03	--	1.8E-03	--	2.8E-04	--	2.8E-04	--	1.5E-03	--	1.5E-03
	Exposure Point Total					2.0E-08				3.1E-09				1.7E-08					1.8E-03				2.8E-04				1.5E-03
Exposure Medium Total - Group 5 Magazine Area						**5.7E-05**				**8.9E-06**				**4.8E-05**					**1.5E+00**				**2.3E-01**				**1.2E+00**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
CNS	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Developmental	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Skin	2.2E-01	--	2.2E-01	8.5E-01	2.3E-01	7.7E-01	**1.2E+00**	3.2E-01	**1.4E+00**	**1.0E+00**	**1.8E+00**	9.8E-01	**1.5E+00**	2.3E-01	**1.2E+00**

TABLE G1-7.1.6

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	1.5E+00	7.5E-06	1.1E-05	NE		7.5E-06	1.1E-05	3.0E-04	6.2E-05	2.1E-01	NE		6.2E-05	2.1E-01
		Dermal	Arsenic	4.8E+00		4.8E+00	1.5E+00	7.3E-07	1.1E-06			7.3E-07	1.1E-06	3.0E-04	5.4E-06	1.8E-02			5.4E-06	1.8E-02
	Exposure Point Total								1.2E-05				1.2E-05			2.2E-01				2.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.5E+01	5.4E-10	8.1E-09			5.4E-10	8.1E-09	8.6E-06	2.3E-09	2.7E-04			2.3E-09	2.7E-04
	Exposure Point Total								8.1E-09				8.1E-09			2.7E-04				2.7E-04
Exposure Medium Total - Group 1 Magazine Area									**1.2E-05**				**1.2E-05**			**2.2E-01**				**2.2E-01**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	2.9E-05	4.3E-05	7.6E-06	1.1E-05	2.6E-05	3.9E-05	3.0E-04	2.3E-04	7.8E-01	6.2E-05	2.1E-01	2.1E-04	7.1E-01
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+00	2.8E-06	4.1E-06	7.4E-07	1.1E-06	2.5E-06	3.8E-06	3.0E-04	2.0E-05	6.8E-02	5.4E-06	1.8E-02	1.9E-05	6.2E-02
	Exposure Point Total								4.7E-05		1.3E-05		4.3E-05			8.5E-01		2.3E-01		7.7E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.5E+01	2.1E-09	3.1E-08	5.5E-10	8.3E-09	1.9E-09	2.8E-08	8.6E-06	8.8E-09	1.0E-03	2.4E-09	2.7E-04	8.1E-09	9.4E-04
	Exposure Point Total								3.1E-08		8.3E-09		2.8E-08			1.0E-03		2.7E-04		9.4E-04
Exposure Medium Total - Group 2 Magazine Area									**4.7E-05**		**1.3E-05**		**4.3E-05**			**8.5E-01**		**2.3E-01**		**7.7E-01**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	4.2E-05	6.3E-05	1.1E-05	1.6E-05	4.8E-05	7.2E-05	3.0E-04	3.4E-04	1.1E+00	8.7E-05	2.9E-01	3.9E-04	1.3E+00
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+00	4.1E-06	6.1E-06	1.0E-06	1.5E-06	4.6E-06	7.0E-06	3.0E-04	3.0E-05	9.9E-02	7.6E-06	2.5E-02	3.4E-05	1.1E-01
	Exposure Point Total								6.9E-05		1.8E-05		7.9E-05			1.2E+00		3.2E-01		1.4E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.5E+01	3.0E-09	4.5E-08	7.7E-10	1.2E-08	3.4E-09	5.2E-08	8.6E-06	1.3E-08	1.5E-03	3.3E-09	3.8E-04	1.5E-08	1.7E-03
	Exposure Point Total								4.5E-08		1.2E-08		5.2E-08			1.5E-03		3.8E-04		1.7E-03
Exposure Medium Total - Group 3 Magazine Area									**6.9E-05**		**1.8E-05**		**7.9E-05**			**1.2E+00**		**3.2E-01**		**1.4E+00**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	3.4E-05	5.1E-05	6.2E-05	9.2E-05	3.3E-05	5.0E-05	3.0E-04	2.8E-04	9.3E-01	5.0E-04	1.7E+00	2.7E-04	9.0E-01
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+00	3.3E-06	5.0E-06	6.0E-06	8.9E-06	3.2E-06	4.8E-06	3.0E-04	2.4E-05	8.1E-02	4.4E-05	1.5E-01	2.4E-05	7.8E-02
	Exposure Point Total								5.6E-05		1.0E-04		5.4E-05			1.0E+00		1.8E+00		9.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.5E+01	2.5E-09	3.7E-08	4.4E-09	6.7E-08	2.4E-09	3.6E-08	8.6E-06	1.1E-08	1.2E-03	1.9E-08	2.2E-03	1.0E-08	1.2E-03
	Exposure Point Total								3.7E-08		6.7E-08		3.6E-08			1.2E-03		2.2E-03		1.2E-03
Exposure Medium Total - Group 4 Magazine Area									**5.6E-05**		**1.0E-04**		**5.5E-05**			**1.0E+00**		**1.8E+00**		**9.8E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	5.0E-05	7.5E-05	7.8E-06	1.2E-05	4.2E-05	6.3E-05	3.0E-04	4.1E-04	1.4E+00	6.4E-05	2.1E-01	3.4E-04	1.1E+00
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+00	4.9E-06	7.3E-06	7.5E-07	1.1E-06	4.1E-06	6.1E-06	3.0E-04	3.6E-05	1.2E-01	5.5E-06	1.8E-02	3.0E-05	1.0E-01
	Exposure Point Total								8.3E-05		1.3E-05		6.9E-05			1.5E+00		2.3E-01		1.2E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.5E+01	3.6E-09	5.4E-08	5.6E-10	8.4E-09	3.0E-09	4.5E-08	8.6E-06	1.6E-08	1.8E-03	2.4E-09	2.8E-04	1.3E-08	1.5E-03
	Exposure Point Total								5.4E-08		8.4E-09		4.5E-08			1.8E-03		2.8E-04		1.5E-03
Exposure Medium Total - Group 5 Magazine Area									**8.3E-05**		**1.3E-05**		**6.9E-05**			**1.5E+00**		**2.3E-01**		**1.2E+00**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.1.6

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Installation Restoration Site 22A, Inland Area, Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	1.1E-05	--	1.1E-06	1.2E-05	NE				1.1E-05	--	1.1E-06	1.2E-05	Skin	2.1E-01	--	1.8E-02	2.2E-01	NE				2.1E-01	--	1.8E-02	2.2E-01
	Exposure Point Total					1.2E-05								1.2E-05					2.2E-01								2.2E-01
	Outdoor Air	Arsenic	--	8.1E-09	--	8.1E-09					--	8.1E-09	--	8.1E-09	Developmental, Cardiovascular, CNS	--	2.7E-04	--	2.7E-04					--	2.7E-04	--	2.7E-04
	Exposure Point Total					8.1E-09								8.1E-09					2.7E-04								2.7E-04
Exposure Medium Total - Group 1 Magazine Area						**1.2E-05**								**1.2E-05**					**2.2E-01**								**2.2E-01**
Group 2	Site Soil	Arsenic	4.3E-05	--	4.1E-06	4.7E-05	1.1E-05	--	1.1E-06	1.3E-05	3.9E-05	--	3.8E-06	4.3E-05	Skin	7.8E-01	--	6.8E-02	8.5E-01	2.1E-01	--	1.8E-02	2.3E-01	7.1E-01	--	6.2E-02	7.7E-01
	Exposure Point Total					4.7E-05				1.3E-05				4.3E-05					8.5E-01				2.3E-01				7.7E-01
	Outdoor Air	Arsenic	--	3.1E-08	--	3.1E-08	--	8.3E-09	--	8.3E-09	--	2.8E-08	--	2.8E-08	Developmental, Cardiovascular, CNS	--	1.0E-03	--	1.0E-03	--	2.7E-04	--	2.7E-04	--	9.4E-04	--	9.4E-04
	Exposure Point Total					3.1E-08				8.3E-09				2.8E-08					1.0E-03				2.7E-04				9.4E-04
Exposure Medium Total - Group 2 Magazine Area						**4.7E-05**				**1.3E-05**				**4.3E-05**					**8.5E-01**				**2.3E-01**				**7.7E-01**
Group 3	Site Soil	Arsenic	6.3E-05	--	6.1E-06	6.9E-05	1.6E-05	--	1.5E-06	1.8E-05	7.2E-05	--	7.0E-06	7.9E-05	Skin	1.1E+00	--	9.9E-02	1.2E+00	2.9E-01	--	2.5E-02	3.2E-01	1.3E+00	--	1.1E-01	1.4E+00
	Exposure Point Total					6.9E-05				1.8E-05				7.9E-05					1.2E+00				3.2E-01				1.4E+00
	Outdoor Air	Arsenic	--	4.5E-08	--	4.5E-08	--	1.2E-08	--	1.2E-08	--	5.2E-08	--	5.2E-08	Developmental, Cardiovascular, CNS	--	1.5E-03	--	1.5E-03	--	3.8E-04	--	3.8E-04	--	1.7E-03	--	1.7E-03
	Exposure Point Total					4.5E-08				1.2E-08				5.2E-08					1.5E-03				3.8E-04				1.7E-03
Exposure Medium Total - Group 3 Magazine Area						**6.9E-05**				**1.8E-05**				**7.9E-05**					**1.2E+00**				**3.2E-01**				**1.4E+00**
Group 4	Site Soil	Arsenic	5.1E-05	--	5.0E-06	5.6E-05	9.2E-05	--	8.9E-06	1.0E-04	5.0E-05	--	4.8E-06	5.4E-05	Skin	9.3E-01	--	8.1E-02	1.0E+00	1.7E+00	--	1.5E-01	1.8E+00	9.0E-01	--	7.8E-02	9.8E-01
	Exposure Point Total					5.6E-05				1.0E-04				5.4E-05					1.0E+00				1.8E+00				9.8E-01
	Outdoor Air	Arsenic	--	3.7E-08	--	3.7E-08	--	6.7E-08	--	6.7E-08	--	3.6E-08	--	3.6E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03	--	2.2E-03	--	2.2E-03	--	1.2E-03	--	1.2E-03
	Exposure Point Total					3.7E-08				6.7E-08				3.6E-08					1.2E-03				2.2E-03				1.2E-03
Exposure Medium Total - Group 4 Magazine Area						**5.6E-05**				**1.0E-04**				**5.5E-05**					**1.0E+00**				**1.8E+00**				**9.8E-01**
Group 5	Site Soil	Arsenic	7.5E-05	--	7.3E-06	8.3E-05	1.2E-05	--	1.1E-06	1.3E-05	6.3E-05	--	6.1E-06	6.9E-05	Skin	1.4E+00	--	1.2E-01	1.5E+00	2.1E-01	--	1.8E-02	2.3E-01	1.1E+00	--	1.0E-01	1.2E+00
	Exposure Point Total					8.3E-05				1.3E-05				6.9E-05					1.5E+00				2.3E-01				1.2E+00
	Outdoor Air	Arsenic	--	5.4E-08	--	5.4E-08	--	8.4E-09	--	8.4E-09	--	4.5E-08	--	4.5E-08	Developmental, Cardiovascular, CNS	--	1.8E-03	--	1.8E-03	--	2.8E-04	--	2.8E-04	--	1.5E-03	--	1.5E-03
	Exposure Point Total					5.4E-08				8.4E-09				4.5E-08					1.8E-03				2.8E-04				1.5E-03
Exposure Medium Total - Group 5 Magazine Area						**8.3E-05**				**1.3E-05**				**6.9E-05**					**1.5E+00**				**2.3E-01**				**1.2E+00**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

Target Organ	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
CNS	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Developmental	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Skin	2.2E-01	--	2.2E-01	8.5E-01	2.3E-01	7.7E-01	**1.2E+00**	3.2E-01	**1.4E+00**	**1.0E+00**	**1.8E+00**	9.8E-01	**1.5E+00**	2.3E-01	**1.2E+00**

TABLE G1-7.2.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NA	NA	9.5E+00	1.9E-07	1.8E-06	NA		NA		3.0E-04	5.3E-07	1.8E-03	NA		NA	
		Dermal	Arsenic	4.8E+00			9.5E+00	6.5E-08	6.1E-07					3.0E-04	1.8E-07	6.0E-04				
	Exposure Point Total								2.4E-06							2.4E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00			1.2E+01	1.3E-12	1.5E-11					8.6E-06	3.5E-12	4.1E-07				
	Exposure Point Total								1.5E-11							4.1E-07				
Exposure Medium Total - Group 1 Magazine Area									**2.4E-06**							**2.4E-03**				
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	NA	NA	9.5E+00	7.1E-07	6.8E-06	NA		NA		3.0E-04	2.0E-06	6.7E-03	NA		NA	
		Dermal	Arsenic	1.8E+01			9.5E+00	2.4E-07	2.3E-06					3.0E-04	6.8E-07	2.3E-03				
	Exposure Point Total								9.1E-06							8.9E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01			1.2E+01	4.7E-12	5.7E-11					8.6E-06	1.3E-11	1.5E-06				
	Exposure Point Total								5.7E-11							1.5E-06				
Exposure Medium Total - Group 2 Magazine Area									**9.1E-06**							**8.9E-03**				
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	NA	NA	9.5E+00	1.0E-06	1.0E-05	NA		NA		3.0E-04	2.9E-06	9.8E-03	NA		NA	
		Dermal	Arsenic	2.7E+01			9.5E+00	3.6E-07	3.4E-06					3.0E-04	1.0E-06	3.3E-03				
	Exposure Point Total								1.3E-05							1.3E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01			1.2E+01	7.0E-12	8.3E-11					8.6E-06	1.9E-11	2.3E-06				
	Exposure Point Total								8.3E-11							2.3E-06				
Exposure Medium Total - Group 3 Magazine Area									**1.3E-05**							**1.3E-02**				
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	NA	NA	9.5E+00	8.6E-07	8.1E-06	NA		NA		3.0E-04	2.4E-06	8.0E-03	NA		NA	
		Dermal	Arsenic	2.2E+01			9.5E+00	2.9E-07	2.8E-06					3.0E-04	8.2E-07	2.7E-03				
	Exposure Point Total								1.1E-05							1.1E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01			1.2E+01	5.7E-12	6.8E-11					8.6E-06	1.6E-11	1.8E-06				
	Exposure Point Total								6.8E-11							1.8E-06				
Exposure Medium Total - Group 4 Magazine Area									**1.1E-05**							**1.1E-02**				
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	NA	NA	9.5E+00	1.3E-06	1.2E-05	NA		NA		3.0E-04	3.5E-06	1.2E-02	NA		NA	
		Dermal	Arsenic	3.2E+01			9.5E+00	4.3E-07	4.1E-06					3.0E-04	1.2E-06	4.0E-03				
	Exposure Point Total								1.6E-05							1.6E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01			1.2E+01	8.3E-12	1.0E-10					8.6E-06	2.3E-11	2.7E-06				
	Exposure Point Total								1.0E-10							2.7E-06				
Exposure Medium Total - Group 5 Magazine Area									**1.6E-05**							**1.6E-02**				

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NA	Not applicable - no complete exposure pathways for this depth interval for this receptor
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.2.1
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	1.8E-06	--	6.1E-07	2.4E-06	NA				NA				Skin	1.8E-03	--	6.0E-04	2.4E-03	NA				NA			
	Exposure Point Total					2.4E-06													2.4E-03								
	Outdoor Air	Arsenic	--	1.5E-11	--	1.5E-11									Developmental, Cardiovascular, CNS	--	4.1E-07	--	4.1E-07								
	Exposure Point Total					1.5E-11													4.1E-07								
Exposure Medium Total - Group 1 Magazine Area						**2.4E-06**													**2.4E-03**								
Group 2	Site Soil	Arsenic	6.8E-06	--	2.3E-06	9.1E-06	NA				NA				Skin	6.7E-03	--	2.3E-03	8.9E-03	NA				NA			
	Exposure Point Total					9.1E-06													8.9E-03								
	Outdoor Air	Arsenic	--	5.7E-11	--	5.7E-11									Developmental, Cardiovascular, CNS	--	1.5E-06	--	1.5E-06								
	Exposure Point Total					5.7E-11													1.5E-06								
Exposure Medium Total - Group 2 Magazine Area						**9.1E-06**													**8.9E-03**								
Group 3	Site Soil	Arsenic	1.0E-05	--	3.4E-06	1.3E-05	NA				NA				Skin	9.8E-03	--	3.3E-03	1.3E-02	NA				NA			
	Exposure Point Total					1.3E-05													1.3E-02								
	Outdoor Air	Arsenic	--	8.3E-11	--	8.3E-11									Developmental, Cardiovascular, CNS	--	2.3E-06	--	2.3E-06								
	Exposure Point Total					8.3E-11													2.3E-06								
Exposure Medium Total - Group 3 Magazine Area						**1.3E-05**													**1.3E-02**								
Group 4	Site Soil	Arsenic	8.1E-06	--	2.8E-06	1.1E-05	NA				NA				Skin	8.0E-03	--	2.7E-03	1.1E-02	NA				NA			
	Exposure Point Total					1.1E-05													1.1E-02								
	Outdoor Air	Arsenic	--	6.8E-11	--	6.8E-11									Developmental, Cardiovascular, CNS	--	1.8E-06	--	1.8E-06								
	Exposure Point Total					6.8E-11													1.8E-06								
Exposure Medium Total - Group 4 Magazine Area						**1.1E-05**													**1.1E-02**								
Group 5	Site Soil	Arsenic	1.2E-05	--	4.1E-06	1.6E-05	NA				NA				Skin	1.2E-02	--	4.0E-03	1.6E-02	NA				NA			
	Exposure Point Total					1.6E-05													1.6E-02								
	Outdoor Air	Arsenic	--	1.0E-10	--	1.0E-10									Developmental, Cardiovascular, CNS	--	2.7E-06	--	2.7E-06								
	Exposure Point Total					1.0E-10													2.7E-06								
Exposure Medium Total - Group 5 Magazine Area						**1.6E-05**													**1.6E-02**								

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
NA	Not applicable - no complete exposure pathways for this depth interval for this receptor
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

Target Organ	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	4.1E-07	--	--	1.5E-06	--	--	2.3E-06	--	--	1.8E-06	--	--	2.7E-06	--	--
CNS	4.1E-07	--	--	1.5E-06	--	--	2.3E-06	--	--	1.8E-06	--	--	2.7E-06	--	--
Developmental	4.1E-07	--	--	1.5E-06	--	--	2.3E-06	--	--	1.8E-06	--	--	2.7E-06	--	--
Skin	2.4E-03	--	--	8.9E-03	--	--	1.3E-02	--	--	1.1E-02	--	--	1.6E-02	--	--

TABLE G1-7.2.2
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

				EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	9.5E+00	1.7E-06	1.6E-05	NE		1.7E-06	1.6E-05	3.0E-04	4.7E-06	1.6E-02	NE		4.7E-06	1.6E-02
		Dermal	Arsenic	4.8E+00		4.8E+00	9.5E+00	5.8E-07	5.5E-06			5.8E-07	5.5E-06	3.0E-04	1.6E-06	5.4E-03			1.6E-06	5.4E-03
	Exposure Point Total								2.1E-05				2.1E-05			2.1E-02				2.1E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.2E+01	1.8E-10	2.1E-09			1.8E-10	2.1E-09	8.6E-06	5.0E-10	5.8E-05			5.0E-10	5.8E-05
	Exposure Point Total								2.1E-09				2.1E-09			5.8E-05				5.8E-05
Exposure Medium Total - Group 1 Magazine Area									**2.1E-05**				**2.1E-05**			**2.1E-02**				**2.1E-02**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	6.4E-06	6.1E-05	1.7E-06	1.6E-05	5.8E-06	5.5E-05	3.0E-04	1.8E-05	6.0E-02	4.8E-06	1.6E-02	1.6E-05	5.4E-02
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	2.2E-06	2.1E-05	5.8E-07	5.5E-06	2.0E-06	1.9E-05	3.0E-04	6.1E-06	2.0E-02	1.6E-06	5.4E-03	5.6E-06	1.9E-02
	Exposure Point Total								8.1E-05		2.2E-05		7.4E-05			8.0E-02		2.1E-02		7.3E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.2E+01	6.8E-10	8.1E-09	1.8E-10	2.2E-09	6.2E-10	7.4E-09	8.6E-06	1.9E-09	2.2E-04	5.1E-10	5.9E-05	1.7E-09	2.0E-04
	Exposure Point Total								8.1E-09		2.2E-09		7.4E-09			2.2E-04		5.9E-05		2.0E-04
Exposure Medium Total - Group 2 Magazine Area									**8.1E-05**		**2.2E-05**		**7.4E-05**			**8.0E-02**		**2.1E-02**		**7.3E-02**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	9.4E-06	8.9E-05	2.4E-06	2.3E-05	1.1E-05	1.0E-04	3.0E-04	2.6E-05	8.7E-02	6.7E-06	2.2E-02	3.0E-05	1.0E-01
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	3.2E-06	3.0E-05	8.1E-07	7.7E-06	3.7E-06	3.5E-05	3.0E-04	9.0E-06	3.0E-02	2.3E-06	7.6E-03	1.0E-05	3.4E-02
	Exposure Point Total								1.2E-04		3.0E-05		1.4E-04			1.2E-01		3.0E-02		1.3E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.2E+01	9.9E-10	1.2E-08	2.5E-10	3.0E-09	1.1E-09	1.4E-08	8.6E-06	2.8E-09	3.2E-04	7.1E-10	8.2E-05	3.2E-09	3.7E-04
	Exposure Point Total								1.2E-08		3.0E-09		1.4E-08			3.2E-04		8.2E-05		3.7E-04
Exposure Medium Total - Group 3 Magazine Area									**1.2E-04**		**3.0E-05**		**1.4E-04**			**1.2E-01**		**3.0E-02**		**1.3E-01**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	7.6E-06	7.3E-05	1.4E-05	1.3E-04	7.4E-06	7.0E-05	3.0E-04	2.1E-05	7.1E-02	3.9E-05	1.3E-01	2.1E-05	6.9E-02
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	2.6E-06	2.5E-05	4.7E-06	4.5E-05	2.5E-06	2.4E-05	3.0E-04	7.3E-06	2.4E-02	1.3E-05	4.4E-02	7.1E-06	2.4E-02
	Exposure Point Total								9.7E-05		1.8E-04		9.4E-05			9.6E-02		1.7E-01		9.3E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.2E+01	8.1E-10	9.7E-09	1.5E-09	1.8E-08	7.8E-10	9.4E-09	8.6E-06	2.3E-09	2.6E-04	4.1E-09	4.7E-04	2.2E-09	2.6E-04
	Exposure Point Total								9.7E-09		1.8E-08		9.4E-09			2.6E-04		4.7E-04		2.6E-04
Exposure Medium Total - Group 4 Magazine Area									**9.7E-05**		**1.8E-04**		**9.4E-05**			**9.6E-02**		**1.7E-01**		**9.3E-02**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	1.1E-05	1.1E-04	1.7E-06	1.7E-05	9.4E-06	8.9E-05	3.0E-04	3.1E-05	1.0E-01	4.9E-06	1.6E-02	2.6E-05	8.8E-02
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	3.8E-06	3.6E-05	5.9E-07	5.6E-06	3.2E-06	3.1E-05	3.0E-04	1.1E-05	3.6E-02	1.7E-06	5.5E-03	9.0E-06	3.0E-02
	Exposure Point Total								1.4E-04		2.2E-05		1.2E-04			1.4E-01		2.2E-02		1.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.2E+01	1.2E-09	1.4E-08	1.8E-10	2.2E-09	1.0E-09	1.2E-08	8.6E-06	3.3E-09	3.9E-04	5.2E-10	6.0E-05	2.8E-09	3.2E-04
	Exposure Point Total								1.4E-08		2.2E-09		1.2E-08			3.9E-04		6.0E-05		3.2E-04
Exposure Medium Total - Group 5 Magazine Area									**1.4E-04**		**2.2E-05**		**1.2E-04**			**1.4E-01**		**2.2E-02**		**1.2E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.2.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	1.6E-05	--	5.5E-06	2.1E-05	NE				1.6E-05	--	5.5E-06	2.1E-05	Skin	1.6E-02	--	5.4E-03	2.1E-02	NE				1.6E-02	--	5.4E-03	2.1E-02
	Exposure Point Total					2.1E-05								2.1E-05					2.1E-02								2.1E-02
	Outdoor Air	Arsenic	--	2.1E-09	--	2.1E-09					--	2.1E-09	--	2.1E-09	Developmental, Cardiovascular, CNS	--	5.8E-05	--	5.8E-05					--	5.8E-05	--	5.8E-05
	Exposure Point Total					2.1E-09								2.1E-09					5.8E-05								5.8E-05
Exposure Medium Total - Group 1 Magazine Area						**2.1E-05**								**2.1E-05**					**2.1E-02**								**2.1E-02**
Group 2	Site Soil	Arsenic	6.1E-05	--	2.1E-05	8.1E-05	1.6E-05	--	5.5E-06	2.2E-05	5.5E-05	--	1.9E-05	7.4E-05	Skin	6.0E-02	--	2.0E-02	8.0E-02	1.6E-02	--	5.4E-03	2.1E-02	5.4E-02	--	1.9E-02	7.3E-02
	Exposure Point Total					8.1E-05				2.2E-05				7.4E-05					8.0E-02				2.1E-02				7.3E-02
	Outdoor Air	Arsenic	--	8.1E-09	--	8.1E-09	--	2.2E-09	--	2.2E-09	--	7.4E-09	--	7.4E-09	Developmental, Cardiovascular, CNS	--	2.2E-04	--	2.2E-04	--	5.9E-05	--	5.9E-05	--	2.0E-04	--	2.0E-04
	Exposure Point Total					8.1E-09				2.2E-09				7.4E-09					2.2E-04				5.9E-05				2.0E-04
Exposure Medium Total - Group 2 Magazine Area						**8.1E-05**				**2.2E-05**				**7.4E-05**					**8.0E-02**				**2.1E-02**				**7.3E-02**
Group 3	Site Soil	Arsenic	8.9E-05	--	3.0E-05	1.2E-04	2.3E-05	--	7.7E-06	3.0E-05	1.0E-04	--	3.5E-05	1.4E-04	Skin	8.7E-02	--	3.0E-02	1.2E-01	2.2E-02	--	7.6E-03	3.0E-02	1.0E-01	--	3.4E-02	1.3E-01
	Exposure Point Total					1.2E-04				3.0E-05				1.4E-04					1.2E-01				3.0E-02				1.3E-01
	Outdoor Air	Arsenic	--	1.2E-08	--	1.2E-08	--	3.0E-09	--	3.0E-09	--	1.4E-08	--	1.4E-08	Developmental, Cardiovascular, CNS	--	3.2E-04	--	3.2E-04	--	8.2E-05	--	8.2E-05	--	3.7E-04	--	3.7E-04
	Exposure Point Total					1.2E-08				3.0E-09				1.4E-08					3.2E-04				8.2E-05				3.7E-04
Exposure Medium Total - Group 3 Magazine Area						**1.2E-04**				**3.0E-05**				**1.4E-04**					**1.2E-01**				**3.0E-02**				**1.3E-01**
Group 4	Site Soil	Arsenic	7.3E-05	--	2.5E-05	9.7E-05	1.3E-04	--	4.5E-05	1.8E-04	7.0E-05	--	2.4E-05	9.4E-05	Skin	7.1E-02	--	2.4E-02	9.6E-02	1.3E-01	--	4.4E-02	1.7E-01	6.9E-02	--	2.4E-02	9.3E-02
	Exposure Point Total					9.7E-05				1.8E-04				9.4E-05					9.6E-02				1.7E-01				9.3E-02
	Outdoor Air	Arsenic	--	9.7E-09	--	9.7E-09	--	1.8E-08	--	1.8E-08	--	9.4E-09	--	9.4E-09	Developmental, Cardiovascular, CNS	--	2.6E-04	--	2.6E-04	--	4.7E-04	--	4.7E-04	--	2.6E-04	--	2.6E-04
	Exposure Point Total					9.7E-09				1.8E-08				9.4E-09					2.6E-04				4.7E-04				2.6E-04
Exposure Medium Total - Group 4 Magazine Area						**9.7E-05**				**1.8E-04**				**9.4E-05**					**9.6E-02**				**1.7E-01**				**9.3E-02**
Group 5	Site Soil	Arsenic	1.1E-04	--	3.6E-05	1.4E-04	1.7E-05	--	5.6E-06	2.2E-05	8.9E-05	--	3.1E-05	1.2E-04	Skin	1.0E-01	--	3.6E-02	1.4E-01	1.6E-02	--	5.5E-03	2.2E-02	8.8E-02	--	3.0E-02	1.2E-01
	Exposure Point Total					1.4E-04				2.2E-05				1.2E-04					1.4E-01				2.2E-02				1.2E-01
	Outdoor Air	Arsenic	--	1.4E-08	--	1.4E-08	--	2.2E-09	--	2.2E-09	--	1.2E-08	--	1.2E-08	Developmental, Cardiovascular, CNS	--	3.9E-04	--	3.9E-04	--	6.0E-05	--	6.0E-05	--	3.2E-04	--	3.2E-04
	Exposure Point Total					1.4E-08				2.2E-09				1.2E-08					3.9E-04				6.0E-05				3.2E-04
Exposure Medium Total - Group 5 Magazine Area						**1.4E-04**				**2.2E-05**				**1.2E-04**					**1.4E-01**				**2.2E-02**				**1.2E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

Target Organ	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	5.8E-05	--	5.8E-05	2.2E-04	5.9E-05	2.0E-04	3.2E-04	8.2E-05	3.7E-04	2.6E-04	4.7E-04	2.6E-04	3.9E-04	6.0E-05	3.2E-04
CNS	5.8E-05	--	5.8E-05	2.2E-04	5.9E-05	2.0E-04	3.2E-04	8.2E-05	3.7E-04	2.6E-04	4.7E-04	2.6E-04	3.9E-04	6.0E-05	3.2E-04
Developmental	5.8E-05	--	5.8E-05	2.2E-04	5.9E-05	2.0E-04	3.2E-04	8.2E-05	3.7E-04	2.6E-04	4.7E-04	2.6E-04	3.9E-04	6.0E-05	3.2E-04
Skin	2.1E-02	--	2.1E-02	8.0E-02	2.1E-02	7.3E-02	1.2E-01	3.0E-02	1.3E-01	9.6E-02	1.7E-01	9.3E-02	1.4E-01	2.2E-02	1.2E-01

TABLE G1-7.2.3

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	9.5E+00	8.0E-08	7.6E-07	NE		8.0E-08	7.6E-07	3.0E-04	5.6E-06	1.9E-02	NE		5.6E-06	1.9E-02
		Dermal	Arsenic	4.8E+00		4.8E+00	9.5E+00	3.3E-08	3.2E-07			3.3E-08	3.2E-07	3.0E-04	2.3E-06	7.7E-03			2.3E-06	7.7E-03
	Exposure Point Total								1.1E-06				1.1E-06			2.6E-02				2.6E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.2E+01	4.8E-09	5.8E-08			4.8E-09	5.8E-08	8.6E-06	3.4E-07	3.9E-02			3.4E-07	3.9E-02
	Exposure Point Total								5.8E-08				5.8E-08			3.9E-02				3.9E-02
Exposure Medium Total - Group 1 Magazine Area									**1.1E-06**				**1.1E-06**			**6.6E-02**				**6.6E-02**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	3.0E-07	2.9E-06	8.1E-08	7.7E-07	2.8E-07	2.6E-06	3.0E-04	2.1E-05	7.1E-02	5.7E-06	1.9E-02	1.9E-05	6.5E-02
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	1.3E-07	1.2E-06	3.4E-08	3.2E-07	1.1E-07	1.1E-06	3.0E-04	8.8E-06	2.9E-02	2.4E-06	7.8E-03	8.0E-06	2.7E-02
	Exposure Point Total								4.1E-06		1.1E-06		3.7E-06			1.0E-01		2.7E-02		9.1E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.2E+01	1.8E-08	2.2E-07	4.9E-09	5.9E-08	1.7E-08	2.0E-07	8.6E-06	1.3E-06	1.5E-01	3.4E-07	4.0E-02	1.2E-06	1.4E-01
	Exposure Point Total								2.2E-07		5.9E-08		2.0E-07			1.5E-01		4.0E-02		1.4E-01
Exposure Medium Total - Group 2 Magazine Area									**4.3E-06**		**1.1E-06**		**3.9E-06**			**2.5E-01**		**6.7E-02**		**2.3E-01**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	4.5E-07	4.2E-06	1.1E-07	1.1E-06	5.1E-07	4.8E-06	3.0E-04	3.1E-05	1.0E-01	7.9E-06	2.6E-02	3.6E-05	1.2E-01
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	1.8E-07	1.8E-06	4.7E-08	4.5E-07	2.1E-07	2.0E-06	3.0E-04	1.3E-05	4.3E-02	3.3E-06	1.1E-02	1.5E-05	4.9E-02
	Exposure Point Total								6.0E-06		1.5E-06		6.8E-06			1.5E-01		3.7E-02		1.7E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.2E+01	2.7E-08	3.2E-07	6.9E-09	8.2E-08	3.1E-08	3.7E-07	8.6E-06	1.9E-06	2.2E-01	4.8E-07	5.6E-02	2.2E-06	2.5E-01
	Exposure Point Total								3.2E-07		8.2E-08		3.7E-07			2.2E-01		5.6E-02		2.5E-01
Exposure Medium Total - Group 3 Magazine Area									**6.3E-06**		**1.6E-06**		**7.2E-06**			**3.7E-01**		**9.3E-02**		**4.2E-01**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	3.6E-07	3.5E-06	6.5E-07	6.2E-06	3.5E-07	3.3E-06	3.0E-04	2.5E-05	8.5E-02	4.6E-05	1.5E-01	2.5E-05	8.2E-02
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	1.5E-07	1.4E-06	2.7E-07	2.6E-06	1.5E-07	1.4E-06	3.0E-04	1.1E-05	3.5E-02	1.9E-05	6.3E-02	1.0E-05	3.4E-02
	Exposure Point Total								4.9E-06		8.8E-06		4.7E-06			1.2E-01		2.2E-01		1.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.2E+01	2.2E-08	2.6E-07	4.0E-08	4.8E-07	2.1E-08	2.6E-07	8.6E-06	1.5E-06	1.8E-01	2.8E-06	3.2E-01	1.5E-06	1.7E-01
	Exposure Point Total								2.6E-07		4.8E-07		2.6E-07			1.8E-01		3.2E-01		1.7E-01
Exposure Medium Total - Group 4 Magazine Area									**5.1E-06**		**9.3E-06**		**5.0E-06**			**3.0E-01**		**5.4E-01**		**2.9E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	5.3E-07	5.1E-06	8.3E-08	7.8E-07	4.5E-07	4.2E-06	3.0E-04	3.7E-05	1.2E-01	5.8E-06	1.9E-02	3.1E-05	1.0E-01
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	2.2E-07	2.1E-06	3.4E-08	3.3E-07	1.9E-07	1.8E-06	3.0E-04	1.5E-05	5.2E-02	2.4E-06	8.0E-03	1.3E-05	4.3E-02
	Exposure Point Total								7.2E-06		1.1E-06		6.0E-06			1.8E-01		2.7E-02		1.5E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.2E+01	3.2E-08	3.9E-07	5.0E-09	6.0E-08	2.7E-08	3.2E-07	8.6E-06	2.3E-06	2.6E-01	3.5E-07	4.1E-02	1.9E-06	2.2E-01
	Exposure Point Total								3.9E-07		6.0E-08		3.2E-07			2.6E-01		4.1E-02		2.2E-01
Exposure Medium Total - Group 5 Magazine Area									**7.6E-06**		**1.2E-06**		**6.3E-06**			**4.4E-01**		**6.8E-02**		**3.7E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.2.3
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	7.6E-07	--	3.2E-07	1.1E-06	NE				7.6E-07	--	3.2E-07	1.1E-06	Skin	1.9E-02	--	7.7E-03	2.6E-02	NE				1.9E-02	--	7.7E-03	2.6E-02
	Exposure Point Total					1.1E-06								1.1E-06					2.6E-02								2.6E-02
	Outdoor Air	Arsenic	--	5.8E-08	--	5.8E-08					--	5.8E-08	--	5.8E-08	Developmental, Cardiovascular, CNS	--	3.9E-02	--	3.9E-02					--	3.9E-02	--	3.9E-02
	Exposure Point Total					5.8E-08								5.8E-08					3.9E-02								3.9E-02
Exposure Medium Total - Group 1 Magazine Area						**1.1E-06**								**1.1E-06**					**6.6E-02**								**6.6E-02**
Group 2	Site Soil	Arsenic	2.9E-06	--	1.2E-06	4.1E-06	7.7E-07	--	3.2E-07	1.1E-06	2.6E-06	--	1.1E-06	3.7E-06	Skin	7.1E-02	--	2.9E-02	1.0E-01	1.9E-02	--	7.8E-03	2.7E-02	6.5E-02	--	2.7E-02	9.1E-02
	Exposure Point Total					4.1E-06				1.1E-06				3.7E-06					1.0E-01				2.7E-02				9.1E-02
	Outdoor Air	Arsenic	--	2.2E-07	--	2.2E-07	--	5.9E-08	--	5.9E-08	--	2.0E-07	--	2.0E-07	Developmental, Cardiovascular, CNS	--	1.5E-01	--	1.5E-01	--	4.0E-02	--	4.0E-02	--	1.4E-01	--	1.4E-01
	Exposure Point Total					2.2E-07				5.9E-08				2.0E-07					1.5E-01				4.0E-02				1.4E-01
Exposure Medium Total - Group 2 Magazine Area						**4.3E-06**				**1.1E-06**				**3.9E-06**					**2.5E-01**				**6.7E-02**				**2.3E-01**
Group 3	Site Soil	Arsenic	4.2E-06	--	1.8E-06	6.0E-06	1.1E-06	--	4.5E-07	1.5E-06	4.8E-06	--	2.0E-06	6.8E-06	Skin	1.0E-01	--	4.3E-02	1.5E-01	2.6E-02	--	1.1E-02	3.7E-02	1.2E-01	--	4.9E-02	1.7E-01
	Exposure Point Total					6.0E-06				1.5E-06				6.8E-06					1.5E-01				3.7E-02				1.7E-01
	Outdoor Air	Arsenic	--	3.2E-07	--	3.2E-07	--	8.2E-08	--	8.2E-08	--	3.7E-07	--	3.7E-07	Developmental, Cardiovascular, CNS	--	2.2E-01	--	2.2E-01	--	5.6E-02	--	5.6E-02	--	2.5E-01	--	2.5E-01
	Exposure Point Total					3.2E-07				8.2E-08				3.7E-07					2.2E-01				5.6E-02				2.5E-01
Exposure Medium Total - Group 3 Magazine Area						**6.3E-06**				**1.6E-06**				**7.2E-06**					**3.7E-01**				**9.3E-02**				**4.2E-01**
Group 4	Site Soil	Arsenic	3.5E-06	--	1.4E-06	4.9E-06	6.2E-06	--	2.6E-06	8.8E-06	3.3E-06	--	1.4E-06	4.7E-06	Skin	8.5E-02	--	3.5E-02	1.2E-01	1.5E-01	--	6.3E-02	2.2E-01	8.2E-02	--	3.4E-02	1.2E-01
	Exposure Point Total					4.9E-06				8.8E-06				4.7E-06					1.2E-01				2.2E-01				1.2E-01
	Outdoor Air	Arsenic	--	2.6E-07	--	2.6E-07	--	4.8E-07	--	4.8E-07	--	2.6E-07	--	2.6E-07	Developmental, Cardiovascular, CNS	--	1.8E-01	--	1.8E-01	--	3.2E-01	--	3.2E-01	--	1.7E-01	--	1.7E-01
	Exposure Point Total					2.6E-07				4.8E-07				2.6E-07					1.8E-01				3.2E-01				1.7E-01
Exposure Medium Total - Group 4 Magazine Area						**5.1E-06**				**9.3E-06**				**5.0E-06**					**3.0E-01**				**5.4E-01**				**2.9E-01**
Group 5	Site Soil	Arsenic	5.1E-06	--	2.1E-06	7.2E-06	7.8E-07	--	3.3E-07	1.1E-06	4.2E-06	--	1.8E-06	6.0E-06	Skin	1.2E-01	--	5.2E-02	1.8E-01	1.9E-02	--	8.0E-03	2.7E-02	1.0E-01	--	4.3E-02	1.5E-01
	Exposure Point Total					7.2E-06				1.1E-06				6.0E-06					1.8E-01				2.7E-02				1.5E-01
	Outdoor Air	Arsenic	--	3.9E-07	--	3.9E-07	--	6.0E-08	--	6.0E-08	--	3.2E-07	--	3.2E-07	Developmental, Cardiovascular, CNS	--	2.6E-01	--	2.6E-01	--	4.1E-02	--	4.1E-02	--	2.2E-01	--	2.2E-01
	Exposure Point Total					3.9E-07				6.0E-08				3.2E-07					2.6E-01				4.1E-02				2.2E-01
Exposure Medium Total - Group 5 Magazine Area						**7.6E-06**				**1.2E-06**				**6.3E-06**					**4.4E-01**				**6.8E-02**				**3.7E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	3.9E-02	--	3.9E-02	1.5E-01	4.0E-02	1.4E-01	2.2E-01	5.6E-02	2.5E-01	1.8E-01	3.2E-01	1.7E-01	2.6E-01	4.1E-02	2.2E-01
CNS	3.9E-02	--	3.9E-02	1.5E-01	4.0E-02	1.4E-01	2.2E-01	5.6E-02	2.5E-01	1.8E-01	3.2E-01	1.7E-01	2.6E-01	4.1E-02	2.2E-01
Developmental	3.9E-02	--	3.9E-02	1.5E-01	4.0E-02	1.4E-01	2.2E-01	5.6E-02	2.5E-01	1.8E-01	3.2E-01	1.7E-01	2.6E-01	4.1E-02	2.2E-01
Skin	2.6E-02	--	2.6E-02	1.0E-01	2.7E-02	9.1E-02	1.5E-01	3.7E-02	1.7E-01	1.2E-01	2.2E-01	1.2E-01	1.8E-01	2.7E-02	1.5E-01

TABLE G1-7.2.4

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	9.5E+00	2.3E-06	2.2E-05	NE		2.3E-06	2.2E-05	3.0E-04	6.6E-06	2.2E-02	NE		6.6E-06	2.2E-02
		Dermal	Arsenic	4.8E+00		4.8E+00	9.5E+00	2.7E-07	2.6E-06			2.7E-07	2.6E-06	3.0E-04	7.9E-07	2.6E-03			7.9E-07	2.6E-03
	Exposure Point Total								2.4E-05				2.4E-05			2.5E-02				2.5E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.2E+01	3.4E-10	4.1E-09			3.4E-10	4.1E-09	8.6E-06	1.0E-09	1.2E-04			1.0E-09	1.2E-04
	Exposure Point Total								4.1E-09				4.1E-09			1.2E-04				1.2E-04
Exposure Medium Total - Group 1 Magazine Area									**2.4E-05**				**2.4E-05**			**2.5E-02**				**2.5E-02**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	8.6E-06	8.1E-05	2.3E-06	2.2E-05	7.8E-06	7.4E-05	3.0E-04	2.5E-05	8.3E-02	6.7E-06	2.2E-02	2.3E-05	7.6E-02
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	1.0E-06	9.7E-06	2.7E-07	2.6E-06	9.4E-07	8.9E-06	3.0E-04	3.0E-06	1.0E-02	8.0E-07	2.7E-03	2.7E-06	9.1E-03
	Exposure Point Total								9.1E-05		2.4E-05		8.3E-05			9.3E-02		2.5E-02		8.5E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.2E+01	1.3E-09	1.6E-08	3.5E-10	4.2E-09	1.2E-09	1.4E-08	8.6E-06	3.8E-09	4.4E-04	1.0E-09	1.2E-04	3.5E-09	4.0E-04
	Exposure Point Total								1.6E-08		4.2E-09		1.4E-08			4.4E-04		1.2E-04		4.0E-04
Exposure Medium Total - Group 2 Magazine Area									**9.1E-05**		**2.4E-05**		**8.3E-05**			**9.4E-02**		**2.5E-02**		**8.6E-02**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	1.3E-05	1.2E-04	3.2E-06	3.0E-05	1.4E-05	1.4E-04	3.0E-04	3.7E-05	1.2E-01	9.3E-06	3.1E-02	4.2E-05	1.4E-01
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	1.5E-06	1.4E-05	3.8E-07	3.6E-06	1.7E-06	1.6E-05	3.0E-04	4.4E-06	1.5E-02	1.1E-06	3.7E-03	5.0E-06	1.7E-02
	Exposure Point Total								1.3E-04		3.4E-05		1.5E-04			1.4E-01		3.5E-02		1.6E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.2E+01	1.9E-09	2.3E-08	4.8E-10	5.8E-09	2.2E-09	2.6E-08	8.6E-06	5.6E-09	6.5E-04	1.4E-09	1.6E-04	6.4E-09	7.4E-04
	Exposure Point Total								2.3E-08		5.8E-09		2.6E-08			6.5E-04		1.6E-04		7.4E-04
Exposure Medium Total - Group 3 Magazine Area									**1.3E-04**		**3.4E-05**		**1.5E-04**			**1.4E-01**		**3.5E-02**		**1.6E-01**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	1.0E-05	9.8E-05	1.8E-05	1.8E-04	9.9E-06	9.4E-05	3.0E-04	3.0E-05	1.0E-01	5.4E-05	1.8E-01	2.9E-05	9.7E-02
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	1.2E-06	1.2E-05	2.2E-06	2.1E-05	1.2E-06	1.1E-05	3.0E-04	3.6E-06	1.2E-02	6.5E-06	2.2E-02	3.5E-06	1.2E-02
	Exposure Point Total								1.1E-04		2.0E-04		1.1E-04			1.1E-01		2.0E-01		1.1E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.2E+01	1.6E-09	1.9E-08	2.8E-09	3.4E-08	1.5E-09	1.8E-08	8.6E-06	4.5E-09	5.3E-04	8.2E-09	9.5E-04	4.4E-09	5.1E-04
	Exposure Point Total								1.9E-08		3.4E-08		1.8E-08			5.3E-04		9.5E-04		5.1E-04
Exposure Medium Total - Group 4 Magazine Area									**1.1E-04**		**2.0E-04**		**1.1E-04**			**1.1E-01**		**2.0E-01**		**1.1E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	1.5E-05	1.4E-04	2.3E-06	2.2E-05	1.3E-05	1.2E-04	3.0E-04	4.4E-05	1.5E-01	6.8E-06	2.3E-02	3.7E-05	1.2E-01
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	1.8E-06	1.7E-05	2.8E-07	2.7E-06	1.5E-06	1.4E-05	3.0E-04	5.3E-06	1.8E-02	8.2E-07	2.7E-03	4.4E-06	1.5E-02
	Exposure Point Total								1.6E-04		2.5E-05		1.3E-04			1.6E-01		2.5E-02		1.4E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.2E+01	2.3E-09	2.7E-08	3.5E-10	4.2E-09	1.9E-09	2.3E-08	8.6E-06	6.7E-09	7.7E-04	1.0E-09	1.2E-04	5.6E-09	6.5E-04
	Exposure Point Total								2.7E-08		4.2E-09		2.3E-08			7.7E-04		1.2E-04		6.5E-04
Exposure Medium Total - Group 5 Magazine Area									**1.6E-04**		**2.5E-05**		**1.3E-04**			**1.6E-01**		**2.6E-02**		**1.4E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.2.4
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	2.2E-05	--	2.6E-06	2.4E-05	NE				2.2E-05	--	2.6E-06	2.4E-05	Skin	2.2E-02	--	2.6E-03	2.5E-02	NE				2.2E-02	--	2.6E-03	2.5E-02
	Exposure Point Total					2.4E-05								2.4E-05					2.5E-02								2.5E-02
	Outdoor Air	Arsenic	--	4.1E-09	--	4.1E-09					--	4.1E-09	--	4.1E-09	Developmental, Cardiovascular, CNS	--	1.2E-04	--	1.2E-04					--	1.2E-04	--	1.2E-04
	Exposure Point Total					4.1E-09								4.1E-09					1.2E-04								1.2E-04
Exposure Medium Total - Group 1 Magazine Area						**2.4E-05**								**2.4E-05**					**2.5E-02**								**2.5E-02**
Group 2	Site Soil	Arsenic	8.1E-05	--	9.7E-06	9.1E-05	2.2E-05	--	2.6E-06	2.4E-05	7.4E-05	--	8.9E-06	8.3E-05	Skin	8.3E-02	--	1.0E-02	9.3E-02	2.2E-02	--	2.7E-03	2.5E-02	7.6E-02	--	9.1E-03	8.5E-02
	Exposure Point Total					9.1E-05				2.4E-05				8.3E-05					9.3E-02				2.5E-02				8.5E-02
	Outdoor Air	Arsenic	--	1.6E-08	--	1.6E-08	--	4.2E-09	--	4.2E-09	--	1.4E-08	--	1.4E-08	Developmental, Cardiovascular, CNS	--	4.4E-04	--	4.4E-04	--	1.2E-04	--	1.2E-04	--	4.0E-04	--	4.0E-04
	Exposure Point Total					1.6E-08				4.2E-09				1.4E-08					4.4E-04				1.2E-04				4.0E-04
Exposure Medium Total - Group 2 Magazine Area						**9.1E-05**				**2.4E-05**				**8.3E-05**					**9.4E-02**				**2.5E-02**				**8.6E-02**
Group 3	Site Soil	Arsenic	1.2E-04	--	1.4E-05	1.3E-04	3.0E-05	--	3.6E-06	3.4E-05	1.4E-04	--	1.6E-05	1.5E-04	Skin	1.2E-01	--	1.5E-02	1.4E-01	3.1E-02	--	3.7E-03	3.5E-02	1.4E-01	--	1.7E-02	1.6E-01
	Exposure Point Total					1.3E-04				3.4E-05				1.5E-04					1.4E-01				3.5E-02				1.6E-01
	Outdoor Air	Arsenic	--	2.3E-08	--	2.3E-08	--	5.8E-09	--	5.8E-09	--	2.6E-08	--	2.6E-08	Developmental, Cardiovascular, CNS	--	6.5E-04	--	6.5E-04	--	1.6E-04	--	1.6E-04	--	7.4E-04	--	7.4E-04
	Exposure Point Total					2.3E-08				5.8E-09				2.6E-08					6.5E-04				1.6E-04				7.4E-04
Exposure Medium Total - Group 3 Magazine Area						**1.3E-04**				**3.4E-05**				**1.5E-04**					**1.4E-01**				**3.5E-02**				**1.6E-01**
Group 4	Site Soil	Arsenic	9.8E-05	--	1.2E-05	1.1E-04	1.8E-04	--	2.1E-05	2.0E-04	9.4E-05	--	1.1E-05	1.1E-04	Skin	1.0E-01	--	1.2E-02	1.1E-01	1.8E-01	--	2.2E-02	2.0E-01	9.7E-02	--	1.2E-02	1.1E-01
	Exposure Point Total					1.1E-04				2.0E-04				1.1E-04					1.1E-01				2.0E-01				1.1E-01
	Outdoor Air	Arsenic	--	1.9E-08	--	1.9E-08	--	3.4E-08	--	3.4E-08	--	1.8E-08	--	1.8E-08	Developmental, Cardiovascular, CNS	--	5.3E-04	--	5.3E-04	--	9.5E-04	--	9.5E-04	--	5.1E-04	--	5.1E-04
	Exposure Point Total					1.9E-08				3.4E-08				1.8E-08					5.3E-04				9.5E-04				5.1E-04
Exposure Medium Total - Group 4 Magazine Area						**1.1E-04**				**2.0E-04**				**1.1E-04**					**1.1E-01**				**2.0E-01**				**1.1E-01**
Group 5	Site Soil	Arsenic	1.4E-04	--	1.7E-05	1.6E-04	2.2E-05	--	2.7E-06	2.5E-05	1.2E-04	--	1.4E-05	1.3E-04	Skin	1.5E-01	--	1.8E-02	1.6E-01	2.3E-02	--	2.7E-03	2.5E-02	1.2E-01	--	1.5E-02	1.4E-01
	Exposure Point Total					1.6E-04				2.5E-05				1.3E-04					1.6E-01				2.5E-02				1.4E-01
	Outdoor Air	Arsenic	--	2.7E-08	--	2.7E-08	--	4.2E-09	--	4.2E-09	--	2.3E-08	--	2.3E-08	Developmental, Cardiovascular, CNS	--	7.7E-04	--	7.7E-04	--	1.2E-04	--	1.2E-04	--	6.5E-04	--	6.5E-04
	Exposure Point Total					2.7E-08				4.2E-09				2.3E-08					7.7E-04				1.2E-04				6.5E-04
Exposure Medium Total - Group 5 Magazine Area						**1.6E-04**				**2.5E-05**				**1.3E-04**					**1.6E-01**				**2.6E-02**				**1.4E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	1.2E-04	--	1.2E-04	4.4E-04	1.2E-04	4.0E-04	6.5E-04	1.6E-04	7.4E-04	5.3E-04	9.5E-04	5.1E-04	7.7E-04	1.2E-04	6.5E-04
CNS	1.2E-04	--	1.2E-04	4.4E-04	1.2E-04	4.0E-04	6.5E-04	1.6E-04	7.4E-04	5.3E-04	9.5E-04	5.1E-04	7.7E-04	1.2E-04	6.5E-04
Developmental	1.2E-04	--	1.2E-04	4.4E-04	1.2E-04	4.0E-04	6.5E-04	1.6E-04	7.4E-04	5.3E-04	9.5E-04	5.1E-04	7.7E-04	1.2E-04	6.5E-04
Skin	2.5E-02	--	2.5E-02	9.3E-02	2.5E-02	8.5E-02	1.4E-01	3.5E-02	1.6E-01	1.1E-01	2.0E-01	1.1E-01	1.6E-01	2.5E-02	1.4E-01

TABLE G1-7.2.5

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	9.5E+00	5.3E-06	5.0E-05	NE		5.3E-06	5.0E-05	3.0E-04	6.2E-05	2.1E-01	NE		6.2E-05	2.1E-01
		Dermal	Arsenic	4.8E+00		4.8E+00	9.5E+00	4.6E-07	4.4E-06			4.6E-07	4.4E-06	3.0E-04	5.4E-06	1.8E-02			5.4E-06	1.8E-02
	Exposure Point Total								5.5E-05				5.5E-05			2.2E-01				2.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.2E+01	2.0E-10	2.4E-09			2.0E-10	2.4E-09	8.6E-06	2.3E-09	2.7E-04			2.3E-09	2.7E-04
	Exposure Point Total								2.4E-09				2.4E-09			2.7E-04				2.7E-04
Exposure Medium Total - Group 1 Magazine Area									**5.5E-05**				**5.5E-05**			**2.2E-01**				**2.2E-01**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	2.0E-05	1.9E-04	5.4E-06	5.1E-05	1.8E-05	1.7E-04	3.0E-04	2.3E-04	7.8E-01	6.2E-05	2.1E-01	2.1E-04	7.1E-01
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	1.7E-06	1.7E-05	4.7E-07	4.4E-06	1.6E-06	1.5E-05	3.0E-04	2.0E-05	6.8E-02	5.4E-06	1.8E-02	1.9E-05	6.2E-02
	Exposure Point Total								2.1E-04		5.5E-05		1.9E-04			8.5E-01		2.3E-01		7.7E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.2E+01	7.6E-10	9.1E-09	2.0E-10	2.4E-09	6.9E-10	8.3E-09	8.6E-06	8.8E-09	1.0E-03	2.4E-09	2.7E-04	8.1E-09	9.4E-04
	Exposure Point Total								9.1E-09		2.4E-09		8.3E-09			1.0E-03		2.7E-04		9.4E-04
Exposure Medium Total - Group 2 Magazine Area									**2.1E-04**		**5.5E-05**		**1.9E-04**			**8.5E-01**		**2.3E-01**		**7.7E-01**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	2.9E-05	2.8E-04	7.5E-06	7.1E-05	3.4E-05	3.2E-04	3.0E-04	3.4E-04	1.1E+00	8.7E-05	2.9E-01	3.9E-04	1.3E+00
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	2.6E-06	2.4E-05	6.5E-07	6.2E-06	2.9E-06	2.8E-05	3.0E-04	3.0E-05	9.9E-02	7.6E-06	2.5E-02	3.4E-05	1.1E-01
	Exposure Point Total								3.0E-04		7.7E-05		3.5E-04			1.2E+00		3.2E-01		1.4E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.2E+01	1.1E-09	1.3E-08	2.8E-10	3.4E-09	1.3E-09	1.5E-08	8.6E-06	1.3E-08	1.5E-03	3.3E-09	3.8E-04	1.5E-08	1.7E-03
	Exposure Point Total								1.3E-08		3.4E-09		1.5E-08			1.5E-03		3.8E-04		1.7E-03
Exposure Medium Total - Group 3 Magazine Area									**3.0E-04**		**7.7E-05**		**3.5E-04**			**1.2E+00**		**3.2E-01**		**1.4E+00**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	2.4E-05	2.3E-04	4.3E-05	4.1E-04	2.3E-05	2.2E-04	3.0E-04	2.8E-04	9.3E-01	5.0E-04	1.7E+00	2.7E-04	9.0E-01
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	2.1E-06	2.0E-05	3.8E-06	3.6E-05	2.0E-06	1.9E-05	3.0E-04	2.4E-05	8.1E-02	4.4E-05	1.5E-01	2.4E-05	7.8E-02
	Exposure Point Total								2.5E-04		4.5E-04		2.4E-04			1.0E+00		1.8E+00		9.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.2E+01	9.1E-10	1.1E-08	1.6E-09	2.0E-08	8.8E-10	1.1E-08	8.6E-06	1.1E-08	1.2E-03	1.9E-08	2.2E-03	1.0E-08	1.2E-03
	Exposure Point Total								1.1E-08		2.0E-08		1.1E-08			1.2E-03		2.2E-03		1.2E-03
Exposure Medium Total - Group 4 Magazine Area									**2.5E-04**		**4.5E-04**		**2.4E-04**			**1.0E+00**		**1.8E+00**		**9.8E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	3.5E-05	3.3E-04	5.5E-06	5.2E-05	2.9E-05	2.8E-04	3.0E-04	4.1E-04	1.4E+00	6.4E-05	2.1E-01	3.4E-04	1.1E+00
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	3.1E-06	2.9E-05	4.7E-07	4.5E-06	2.6E-06	2.4E-05	3.0E-04	3.6E-05	1.2E-01	5.5E-06	1.8E-02	3.0E-05	1.0E-01
	Exposure Point Total								3.6E-04		5.6E-05		3.0E-04			1.5E+00		2.3E-01		1.2E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.2E+01	1.3E-09	1.6E-08	2.1E-10	2.5E-09	1.1E-09	1.3E-08	8.6E-06	1.6E-08	1.8E-03	2.4E-09	2.8E-04	1.3E-08	1.5E-03
	Exposure Point Total								1.6E-08		2.5E-09		1.3E-08			1.8E-03		2.8E-04		1.5E-03
Exposure Medium Total - Group 5 Magazine Area									**3.6E-04**		**5.6E-05**		**3.0E-04**			**1.5E+00**		**2.3E-01**		**1.2E+00**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.2.5
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	5.0E-05	--	4.4E-06	5.5E-05	NE				5.0E-05	--	4.4E-06	5.5E-05	Skin	2.1E-01	--	1.8E-02	2.2E-01	NE				2.1E-01	--	1.8E-02	2.2E-01
	Exposure Point Total					5.5E-05								5.5E-05					2.2E-01								2.2E-01
	Outdoor Air	Arsenic	--	2.4E-09	--	2.4E-09					--	2.4E-09	--	2.4E-09	Developmental, Cardiovascular, CNS	--	2.7E-04	--	2.7E-04					--	2.7E-04	--	2.7E-04
	Exposure Point Total					2.4E-09								2.4E-09					2.7E-04								2.7E-04
Exposure Medium Total - Group 1 Magazine Area						**5.5E-05**								**5.5E-05**					**2.2E-01**								**2.2E-01**
Group 2	Site Soil	Arsenic	1.9E-04	--	1.7E-05	2.1E-04	5.1E-05	--	4.4E-06	5.5E-05	1.7E-04	--	1.5E-05	1.9E-04	Skin	7.8E-01	--	6.8E-02	8.5E-01	2.1E-01	--	1.8E-02	2.3E-01	7.1E-01	--	6.2E-02	7.7E-01
	Exposure Point Total					2.1E-04				5.5E-05				1.9E-04					8.5E-01				2.3E-01				7.7E-01
	Outdoor Air	Arsenic	--	9.1E-09	--	9.1E-09	--	2.4E-09	--	2.4E-09	--	8.3E-09	--	8.3E-09	Developmental, Cardiovascular, CNS	--	1.0E-03	--	1.0E-03	--	2.7E-04	--	2.7E-04	--	9.4E-04	--	9.4E-04
	Exposure Point Total					9.1E-09				2.4E-09				8.3E-09					1.0E-03				2.7E-04				9.4E-04
Exposure Medium Total - Group 2 Magazine Area						**2.1E-04**				**5.5E-05**				**1.9E-04**					**8.5E-01**				**2.3E-01**				**7.7E-01**
Group 3	Site Soil	Arsenic	2.8E-04	--	2.4E-05	3.0E-04	7.1E-05	--	6.2E-06	7.7E-05	3.2E-04	--	2.8E-05	3.5E-04	Skin	1.1E+00	--	9.9E-02	1.2E+00	2.9E-01	--	2.5E-02	3.2E-01	1.3E+00	--	1.1E-01	1.4E+00
	Exposure Point Total					3.0E-04				7.7E-05				3.5E-04					1.2E+00				3.2E-01				1.4E+00
	Outdoor Air	Arsenic	--	1.3E-08	--	1.3E-08	--	3.4E-09	--	3.4E-09	--	1.5E-08	--	1.5E-08	Developmental, Cardiovascular, CNS	--	1.5E-03	--	1.5E-03	--	3.8E-04	--	3.8E-04	--	1.7E-03	--	1.7E-03
	Exposure Point Total					1.3E-08				3.4E-09				1.5E-08					1.5E-03				3.8E-04				1.7E-03
Exposure Medium Total - Group 3 Magazine Area						**3.0E-04**				**7.7E-05**				**3.5E-04**					**1.2E+00**				**3.2E-01**				**1.4E+00**
Group 4	Site Soil	Arsenic	2.3E-04	--	2.0E-05	2.5E-04	4.1E-04	--	3.6E-05	4.5E-04	2.2E-04	--	1.9E-05	2.4E-04	Skin	9.3E-01	--	8.1E-02	1.0E+00	1.7E+00	--	1.5E-01	1.8E+00	9.0E-01	--	7.8E-02	9.8E-01
	Exposure Point Total					2.5E-04				4.5E-04				2.4E-04					1.0E+00				1.8E+00				9.8E-01
	Outdoor Air	Arsenic	--	1.1E-08	--	1.1E-08	--	2.0E-08	--	2.0E-08	--	1.1E-08	--	1.1E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03	--	2.2E-03	--	2.2E-03	--	1.2E-03	--	1.2E-03
	Exposure Point Total					1.1E-08				2.0E-08				1.1E-08					1.2E-03				2.2E-03				1.2E-03
Exposure Medium Total - Group 4 Magazine Area						**2.5E-04**				**4.5E-04**				**2.4E-04**					**1.0E+00**				**1.8E+00**				**9.8E-01**
Group 5	Site Soil	Arsenic	3.3E-04	--	2.9E-05	3.6E-04	5.2E-05	--	4.5E-06	5.6E-05	2.8E-04	--	2.4E-05	3.0E-04	Skin	1.4E+00	--	1.2E-01	1.5E+00	2.1E-01	--	1.8E-02	2.3E-01	1.1E+00	--	1.0E-01	1.2E+00
	Exposure Point Total					3.6E-04				5.6E-05				3.0E-04					1.5E+00				2.3E-01				1.2E+00
	Outdoor Air	Arsenic	--	1.6E-08	--	1.6E-08	--	2.5E-09	--	2.5E-09	--	1.3E-08	--	1.3E-08	Developmental, Cardiovascular, CNS	--	1.8E-03	--	1.8E-03	--	2.8E-04	--	2.8E-04	--	1.5E-03	--	1.5E-03
	Exposure Point Total					1.6E-08				2.5E-09				1.3E-08					1.8E-03				2.8E-04				1.5E-03
Exposure Medium Total - Group 5 Magazine Area						**3.6E-04**				**5.6E-05**				**3.0E-04**					**1.5E+00**				**2.3E-01**				**1.2E+00**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
CNS	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Developmental	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Skin	2.2E-01	--	2.2E-01	8.5E-01	2.3E-01	7.7E-01	**1.2E+00**	3.2E-01	**1.4E+00**	**1.0E+00**	**1.8E+00**	9.8E-01	**1.5E+00**	2.3E-01	**1.2E+00**

TABLE G1-7.2.6

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	Site Soil	Ingestion	Arsenic	4.8E+00	NE	4.8E+00	9.5E+00	7.5E-06	7.2E-05	NE		7.5E-06	7.2E-05	3.0E-04	6.2E-05	2.1E-01	NE		6.2E-05	2.1E-01
		Dermal	Arsenic	4.8E+00		4.8E+00	9.5E+00	7.3E-07	6.9E-06			7.3E-07	6.9E-06	3.0E-04	5.4E-06	1.8E-02			5.4E-06	1.8E-02
	Exposure Point Total								7.9E-05				7.9E-05			2.2E-01				2.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	4.8E+00		4.8E+00	1.2E+01	5.4E-10	6.5E-09			5.4E-10	6.5E-09	8.6E-06	2.3E-09	2.7E-04			2.3E-09	2.7E-04
	Exposure Point Total								6.5E-09				6.5E-09			2.7E-04				2.7E-04
Exposure Medium Total - Group 1 Magazine Area									**7.9E-05**				**7.9E-05**			**2.2E-01**				**2.2E-01**
Group 2	Site Soil	Ingestion	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	2.9E-05	2.7E-04	7.6E-06	7.3E-05	2.6E-05	2.5E-04	3.0E-04	2.3E-04	7.8E-01	6.2E-05	2.1E-01	2.1E-04	7.1E-01
		Dermal	Arsenic	1.8E+01	4.9E+00	1.7E+01	9.5E+00	2.8E-06	2.6E-05	7.4E-07	7.0E-06	2.5E-06	2.4E-05	3.0E-04	2.0E-05	6.8E-02	5.4E-06	1.8E-02	1.9E-05	6.2E-02
	Exposure Point Total								3.0E-04		8.0E-05		2.7E-04			8.5E-01		2.3E-01		7.7E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.8E+01	4.9E+00	1.7E+01	1.2E+01	2.1E-09	2.5E-08	5.5E-10	6.6E-09	1.9E-09	2.3E-08	8.6E-06	8.8E-09	1.0E-03	2.4E-09	2.7E-04	8.1E-09	9.4E-04
	Exposure Point Total								2.5E-08		6.6E-09		2.3E-08			1.0E-03		2.7E-04		9.4E-04
Exposure Medium Total - Group 2 Magazine Area									**3.0E-04**		**8.0E-05**		**2.7E-04**			**8.5E-01**		**2.3E-01**		**7.7E-01**
Group 3	Site Soil	Ingestion	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	4.2E-05	4.0E-04	1.1E-05	1.0E-04	4.8E-05	4.6E-04	3.0E-04	3.4E-04	1.1E+00	8.7E-05	2.9E-01	3.9E-04	1.3E+00
		Dermal	Arsenic	2.7E+01	6.8E+00	3.1E+01	9.5E+00	4.1E-06	3.9E-05	1.0E-06	9.8E-06	4.6E-06	4.4E-05	3.0E-04	3.0E-05	9.9E-02	7.6E-06	2.5E-02	3.4E-05	1.1E-01
	Exposure Point Total								4.4E-04		1.1E-04		5.0E-04			1.2E+00		3.2E-01		1.4E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.7E+01	6.8E+00	3.1E+01	1.2E+01	3.0E-09	3.6E-08	7.7E-10	9.2E-09	3.4E-09	4.1E-08	8.6E-06	1.3E-08	1.5E-03	3.3E-09	3.8E-04	1.5E-08	1.7E-03
	Exposure Point Total								3.6E-08		9.2E-09		4.1E-08			1.5E-03		3.8E-04		1.7E-03
Exposure Medium Total - Group 3 Magazine Area									**4.4E-04**		**1.1E-04**		**5.0E-04**			**1.2E+00**		**3.2E-01**		**1.4E+00**
Group 4	Site Soil	Ingestion	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	3.4E-05	3.3E-04	6.2E-05	5.9E-04	3.3E-05	3.1E-04	3.0E-04	2.8E-04	9.3E-01	5.0E-04	1.7E+00	2.7E-04	9.0E-01
		Dermal	Arsenic	2.2E+01	3.9E+01	2.1E+01	9.5E+00	3.3E-06	3.2E-05	6.0E-06	5.7E-05	3.2E-06	3.0E-05	3.0E-04	2.4E-05	8.1E-02	4.4E-05	1.5E-01	2.4E-05	7.8E-02
	Exposure Point Total								3.6E-04		6.4E-04		3.5E-04			1.0E+00		1.8E+00		9.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01	3.9E+01	2.1E+01	1.2E+01	2.5E-09	3.0E-08	4.4E-09	5.3E-08	2.4E-09	2.9E-08	8.6E-06	1.1E-08	1.2E-03	1.9E-08	2.2E-03	1.0E-08	1.2E-03
	Exposure Point Total								3.0E-08		5.3E-08		2.9E-08			1.2E-03		2.2E-03		1.2E-03
Exposure Medium Total - Group 4 Magazine Area									**3.6E-04**		**6.4E-04**		**3.5E-04**			**1.0E+00**		**1.8E+00**		**9.8E-01**
Group 5	Site Soil	Ingestion	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	5.0E-05	4.8E-04	7.8E-06	7.4E-05	4.2E-05	4.0E-04	3.0E-04	4.1E-04	1.4E+00	6.4E-05	2.1E-01	3.4E-04	1.1E+00
		Dermal	Arsenic	3.2E+01	5.0E+00	2.7E+01	9.5E+00	4.9E-06	4.6E-05	7.5E-07	7.2E-06	4.1E-06	3.9E-05	3.0E-04	3.6E-05	1.2E-01	5.5E-06	1.8E-02	3.0E-05	1.0E-01
	Exposure Point Total								5.2E-04		8.1E-05		4.4E-04			1.5E+00		2.3E-01		1.2E+00
	Outdoor Air	Inhalation (Partculates)	Arsenic	3.2E+01	5.0E+00	2.7E+01	1.2E+01	3.6E-09	4.3E-08	5.6E-10	6.7E-09	3.0E-09	3.6E-08	8.6E-06	1.6E-08	1.8E-03	2.4E-09	2.8E-04	1.3E-08	1.5E-03
	Exposure Point Total								4.3E-08		6.7E-09		3.6E-08			1.8E-03		2.8E-04		1.5E-03
Exposure Medium Total - Group 5 Magazine Area									**5.2E-04**		**8.1E-05**		**4.4E-04**			**1.5E+00**		**2.3E-01**		**1.2E+00**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - subsurface soil samples not collected
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G1-8.2.6
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, TOTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT
RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	Site Soil	Arsenic	7.2E-05	--	6.9E-06	7.9E-05	NE				7.2E-05	--	6.9E-06	7.9E-05	Skin	2.1E-01	--	1.8E-02	2.2E-01	NE				2.1E-01	--	1.8E-02	2.2E-01
	Exposure Point Total					7.9E-05								7.9E-05					2.2E-01								2.2E-01
	Outdoor Air	Arsenic	--	6.5E-09	--	6.5E-09					--	6.5E-09	--	6.5E-09	Developmental, Cardiovascular, CNS	--	2.7E-04	--	2.7E-04					--	2.7E-04	--	2.7E-04
	Exposure Point Total					6.5E-09								6.5E-09					2.7E-04								2.7E-04
Exposure Medium Total - Group 1 Magazine Area						**7.9E-05**								**7.9E-05**					**2.2E-01**								**2.2E-01**
Group 2	Site Soil	Arsenic	2.7E-04	--	2.6E-05	3.0E-04	7.3E-05	--	7.0E-06	8.0E-05	2.5E-04	--	2.4E-05	2.7E-04	Skin	7.8E-01	--	6.8E-02	8.5E-01	2.1E-01	--	1.8E-02	2.3E-01	7.1E-01	--	6.2E-02	7.7E-01
	Exposure Point Total					3.0E-04				8.0E-05				2.7E-04					8.5E-01				2.3E-01				7.7E-01
	Outdoor Air	Arsenic	--	2.5E-08	--	2.5E-08	--	6.6E-09	--	6.6E-09	--	2.3E-08	--	2.3E-08	Developmental, Cardiovascular, CNS	--	1.0E-03	--	1.0E-03	--	2.7E-04	--	2.7E-04	--	9.4E-04	--	9.4E-04
	Exposure Point Total					2.5E-08				6.6E-09				2.3E-08					1.0E-03				2.7E-04				9.4E-04
Exposure Medium Total - Group 2 Magazine Area						**3.0E-04**				**8.0E-05**				**2.7E-04**					**8.5E-01**				**2.3E-01**				**7.7E-01**
Group 3	Site Soil	Arsenic	4.0E-04	--	3.9E-05	4.4E-04	1.0E-04	--	9.8E-06	1.1E-04	4.6E-04	--	4.4E-05	5.0E-04	Skin	1.1E+00	--	9.9E-02	1.2E+00	2.9E-01	--	2.5E-02	3.2E-01	1.3E+00	--	1.1E-01	1.4E+00
	Exposure Point Total					4.4E-04				1.1E-04				5.0E-04					1.2E+00				3.2E-01				1.4E+00
	Outdoor Air	Arsenic	--	3.6E-08	--	3.6E-08	--	9.2E-09	--	9.2E-09	--	4.1E-08	--	4.1E-08	Developmental, Cardiovascular, CNS	--	1.5E-03	--	1.5E-03	--	3.8E-04	--	3.8E-04	--	1.7E-03	--	1.7E-03
	Exposure Point Total					3.6E-08				9.2E-09				4.1E-08					1.5E-03				3.8E-04				1.7E-03
Exposure Medium Total - Group 3 Magazine Area						**4.4E-04**				**1.1E-04**				**5.0E-04**					**1.2E+00**				**3.2E-01**				**1.4E+00**
Group 4	Site Soil	Arsenic	3.3E-04	--	3.2E-05	3.6E-04	5.9E-04	--	5.7E-05	6.4E-04	3.1E-04	--	3.0E-05	3.5E-04	Skin	9.3E-01	--	8.1E-02	1.0E+00	1.7E+00	--	1.5E-01	1.8E+00	9.0E-01	--	7.8E-02	9.8E-01
	Exposure Point Total					3.6E-04				6.4E-04				3.5E-04					1.0E+00				1.8E+00				9.8E-01
	Outdoor Air	Arsenic	--	3.0E-08	--	3.0E-08	--	5.3E-08	--	5.3E-08	--	2.9E-08	--	2.9E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03	--	2.2E-03	--	2.2E-03	--	1.2E-03	--	1.2E-03
	Exposure Point Total					3.0E-08				5.3E-08				2.9E-08					1.2E-03				2.2E-03				1.2E-03
Exposure Medium Total - Group 4 Magazine Area						**3.6E-04**				**6.4E-04**				**3.5E-04**					**1.0E+00**				**1.8E+00**				**9.8E-01**
Group 5	Site Soil	Arsenic	4.8E-04	--	4.6E-05	5.2E-04	7.4E-05	--	7.2E-06	8.1E-05	4.0E-04	--	3.9E-05	4.4E-04	Skin	1.4E+00	--	1.2E-01	1.5E+00	2.1E-01	--	1.8E-02	2.3E-01	1.1E+00	--	1.0E-01	1.2E+00
	Exposure Point Total					5.2E-04				8.1E-05				4.4E-04					1.5E+00				2.3E-01				1.2E+00
	Outdoor Air	Arsenic	--	4.3E-08	--	4.3E-08	--	6.7E-09	--	6.7E-09	--	3.6E-08	--	3.6E-08	Developmental, Cardiovascular, CNS	--	1.8E-03	--	1.8E-03	--	2.8E-04	--	2.8E-04	--	1.5E-03	--	1.5E-03
	Exposure Point Total					4.3E-08				6.7E-09				3.6E-08					1.8E-03				2.8E-04				1.5E-03
Exposure Medium Total - Group 5 Magazine Area						**5.2E-04**				**8.1E-05**				**4.4E-04**					**1.5E+00**				**2.3E-01**				**1.2E+00**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
NE	Not evaluated - subsurface soil samples not collected
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

Target Organ	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
CNS	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Developmental	2.7E-04	--	2.7E-04	1.0E-03	2.7E-04	9.4E-04	1.5E-03	3.8E-04	1.7E-03	1.2E-03	2.2E-03	1.2E-03	1.8E-03	2.8E-04	1.5E-03
Skin	2.2E-01	--	2.2E-01	8.5E-01	2.3E-01	7.7E-01	**1.2E+00**	3.2E-01	**1.4E+00**	**1.0E+00**	**1.8E+00**	9.8E-01	**1.5E+00**	2.3E-01	**1.2E+00**

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
17	background risks	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix G: Attachment G2. Tetra Tech. June 1, 2009.

ATTACHMENT G2
EPA RAGS PART D TABLES 7 THROUGH 9 – BACKGROUND RISK EVALUATION

(Tables to be provided on CD only)

TABLES

Chemical Cancer Risks and Noncancer Hazards, Federal Toxicity Criteria

G2-7.1.1 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Current Rancher

G2-8.1.1 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Current Rancher

G2-7.1.2 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G2-8.1.2 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G2-7.1.3 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Construction Worker

G2-8.1.3 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Construction Worker

G2-7.1.4 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult Resident

G2-8.1.4 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult Resident

G2-7.1.5 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Child Resident

G2-8.1.5 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Child Resident

G2-7.1.6 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult and Child Resident

G2-8.1.6 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult and Child Resident

Chemical Cancer Risks and Noncancer Hazards, State of California Toxicity Criteria

G2-7.2.1 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Rancher

G2-8.2.1 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Rancher

G2-7.2.2 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G2-8.2.2 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G2-7.2.3 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Construction Worker

G2-8.2.3 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Construction Worker

G2-7.2.4 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult Resident

G2-8.2.4 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult Resident

G2-7.2.5 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Child Resident

G2-8.2.5 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Child Resident

G2-7.2.6 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult and Child Resident

G2-8.2.6 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Background Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult and Child Resident

TABLE G2-7.1.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	1.5E+00	3.9E-07	5.9E-07	3.0E-04	1.1E-06	3.7E-03
	Dermal	Arsenic	1.0E+01	1.5E+00	1.3E-07	2.0E-07	3.0E-04	3.7E-07	1.2E-03
Exposure Point Total						7.9E-07			4.9E-03
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.5E+01	2.6E-12	3.9E-11	8.6E-06	7.3E-12	8.4E-07
Exposure Point Total						3.9E-11			8.4E-07
Total						**7.9E-07**			**4.9E-03**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.1.1
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	5.9E-07	--	2.0E-07	7.9E-07	Skin	3.7E-03	--	1.2E-03	4.9E-03
Exposure Point Total					7.9E-07					4.9E-03
Outdoor Air	Arsenic	--	3.9E-11	--	3.9E-11	Developmental, Cardiovascular, CNS	--	8.4E-07	--	8.4E-07
Exposure Point Total					3.9E-11					8.4E-07
Total					**7.9E-07**					**4.9E-03**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	8.4E-07
CNS	8.4E-07
Developmental	8.4E-07
Skin	4.9E-03

TABLE G2-7.1.2
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	1.5E+00	3.5E-06	5.2E-06	3.0E-04	9.8E-06	3.3E-02
	Dermal	Arsenic	1.0E+01	1.5E+00	1.2E-06	1.8E-06	3.0E-04	3.3E-06	1.1E-02
Exposure Point Total						7.0E-06			4.4E-02
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.5E+01	3.7E-10	5.6E-09	8.6E-06	1.0E-09	1.2E-04
Exposure Point Total						5.6E-09			1.2E-04
Total						**7.0E-06**			**4.4E-02**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.1.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	5.2E-06	--	1.8E-06	7.0E-06	Skin	3.3E-02	--	1.1E-02	4.4E-02
Exposure Point Total					7.0E-06					4.4E-02
Outdoor Air	Arsenic	--	5.6E-09	--	5.6E-09	Developmental, Cardiovascular, CNS	--	1.2E-04	--	1.2E-04
Exposure Point Total					5.6E-09					1.2E-04
Total					**7.0E-06**					**4.4E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	1.2E-04
CNS	1.2E-04
Developmental	1.2E-04
Skin	4.4E-02

TABLE G2-7.1.3
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	1.5E+00	1.7E-07	2.5E-07	3.0E-04	1.2E-05	3.9E-02
	Dermal	Arsenic	1.0E+01	1.5E+00	6.9E-08	1.0E-07	3.0E-04	4.8E-06	1.6E-02
Exposure Point Total						3.5E-07			5.5E-02
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.5E+01	7.6E-12	1.1E-10	8.6E-06	5.3E-10	6.2E-05
Exposure Point Total						1.1E-10			6.2E-05
Total						**3.5E-07**			**5.5E-02**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.1.3
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	2.5E-07	--	1.0E-07	3.5E-07	Skin	3.9E-02	--	1.6E-02	5.5E-02
Exposure Point Total					3.5E-07					5.5E-02
Outdoor Air	Arsenic	--	1.1E-10	--	1.1E-10	Developmental, Cardiovascular, CNS	--	6.2E-05	--	6.2E-05
Exposure Point Total					1.1E-10					6.2E-05
Total					**3.5E-07**					**5.5E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	6.2E-05
CNS	6.2E-05
Developmental	6.2E-05
Skin	5.5E-02

TABLE G2-7.1.4
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	1.5E+00	4.7E-06	7.0E-06	3.0E-04	1.4E-05	4.6E-02
	Dermal	Arsenic	1.0E+01	1.5E+00	5.6E-07	8.4E-07	3.0E-04	1.6E-06	5.5E-03
Exposure Point Total						7.9E-06			5.1E-02
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.5E+01	7.1E-10	1.1E-08	8.6E-06	2.1E-09	2.4E-04
Exposure Point Total						1.1E-08			2.4E-04
Total						**7.9E-06**			**5.1E-02**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.1.4
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	7.0E-06	--	8.4E-07	7.9E-06	Skin	4.6E-02	--	5.5E-03	5.1E-02
Exposure Point Total					7.9E-06					5.1E-02
Outdoor Air	Arsenic	--	1.1E-08	--	1.1E-08	Developmental, Cardiovascular, CNS	--	2.4E-04	--	2.4E-04
Exposure Point Total					1.1E-08					2.4E-04
Total					**7.9E-06**					**5.1E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	2.4E-04
CNS	2.4E-04
Developmental	2.4E-04
Skin	5.1E-02

TABLE G2-7.1.5
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Child

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	1.5E+00	1.1E-05	1.6E-05	3.0E-04	1.3E-04	4.3E-01
	Dermal	Arsenic	1.0E+01	1.5E+00	9.5E-07	1.4E-06	3.0E-04	1.1E-05	3.7E-02
Exposure Point Total						1.8E-05			4.6E-01
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.5E+01	4.2E-10	6.2E-09	8.6E-06	4.8E-09	5.6E-04
Exposure Point Total						6.2E-09			5.6E-04
Total						**1.8E-05**			**4.6E-01**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.1.5
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Child

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	1.6E-05	--	1.4E-06	1.8E-05	Skin	4.3E-01	--	3.7E-02	4.6E-01
Exposure Point Total					1.8E-05					4.6E-01
Outdoor Air	Arsenic	--	6.2E-09	--	6.2E-09	Developmental, Cardiovascular, CNS	--	5.6E-04	--	5.6E-04
Exposure Point Total					6.2E-09					5.6E-04
Total					**1.8E-05**					**4.6E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	5.6E-04
CNS	5.6E-04
Developmental	5.6E-04
Skin	4.6E-01

TABLE G2-7.1.6
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	1.5E+00	1.6E-05	2.3E-05	3.0E-04	1.3E-04	4.3E-01
	Dermal	Arsenic	1.0E+01	1.5E+00	1.5E-06	2.3E-06	3.0E-04	1.1E-05	3.7E-02
Exposure Point Total						2.6E-05			4.6E-01
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.5E+01	1.1E-09	1.7E-08	8.6E-06	4.8E-09	5.6E-04
Exposure Point Total						1.7E-08			5.6E-04
Total						**2.6E-05**			**4.6E-01**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.1.6
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	2.3E-05	--	2.3E-06	2.6E-05	Skin	4.3E-01	--	3.7E-02	4.6E-01
Exposure Point Total					2.6E-05					4.6E-01
Outdoor Air	Arsenic	--	1.7E-08	--	1.7E-08	Developmental, Cardiovascular, CNS	--	5.6E-04	--	5.6E-04
Exposure Point Total					1.7E-08					5.6E-04
Total					**2.6E-05**					**4.6E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	5.6E-04
CNS	5.6E-04
Developmental	5.6E-04
Skin	4.6E-01

TABLE G2-7.2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	9.5E+00	3.9E-07	3.7E-06	3.0E-04	1.1E-06	3.7E-03
	Dermal	Arsenic	1.0E+01	9.5E+00	1.3E-07	1.3E-06	3.0E-04	3.7E-07	1.2E-03
Exposure Point Total						5.0E-06			4.9E-03
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.2E+01	2.6E-12	3.1E-11	8.6E-06	7.3E-12	8.4E-07
Exposure Point Total						3.1E-11			8.4E-07
Total						**5.0E-06**			**4.9E-03**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.2.1
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	3.7E-06	--	1.3E-06	5.0E-06	Skin	3.7E-03	--	1.2E-03	4.9E-03
Exposure Point Total					5.0E-06					4.9E-03
Outdoor Air	Arsenic	--	3.1E-11	--	3.1E-11	Developmental, Cardiovascular, CNS	--	8.4E-07	--	8.4E-07
Exposure Point Total					3.1E-11					8.4E-07
Total					**5.0E-06**					**4.9E-03**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	8.4E-07
CNS	8.4E-07
Developmental	8.4E-07
Skin	4.9E-03

TABLE G2-7.2.2
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	9.5E+00	3.5E-06	3.3E-05	3.0E-04	9.8E-06	3.3E-02
	Dermal	Arsenic	1.0E+01	9.5E+00	1.2E-06	1.1E-05	3.0E-04	3.3E-06	1.1E-02
Exposure Point Total						4.5E-05			4.4E-02
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.2E+01	3.7E-10	4.4E-09	8.6E-06	1.0E-09	1.2E-04
Exposure Point Total						4.4E-09			1.2E-04
Total						**4.5E-05**			**4.4E-02**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.2.2
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	3.3E-05	--	1.1E-05	4.5E-05	Skin	3.3E-02	--	1.1E-02	4.4E-02
Exposure Point Total					4.5E-05					4.4E-02
Outdoor Air	Arsenic	--	4.4E-09	--	4.4E-09	Developmental, Cardiovascular, CNS	--	1.2E-04	--	1.2E-04
Exposure Point Total					4.4E-09					1.2E-04
Total					**4.5E-05**					**4.4E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	1.2E-04
CNS	1.2E-04
Developmental	1.2E-04
Skin	4.4E-02

TABLE G2-7.2.3
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	9.5E+00	1.7E-07	1.6E-06	3.0E-04	1.2E-05	3.9E-02
	Dermal	Arsenic	1.0E+01	9.5E+00	6.9E-08	6.5E-07	3.0E-04	4.8E-06	1.6E-02
Exposure Point Total						2.2E-06			5.5E-02
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.2E+01	7.6E-12	9.1E-11	8.6E-06	5.3E-10	6.2E-05
Exposure Point Total						9.1E-11			6.2E-05
Total						**2.2E-06**			**5.5E-02**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.2.3
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

RI Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	1.6E-06	--	6.5E-07	2.2E-06	Skin	3.9E-02	--	1.6E-02	5.5E-02
Exposure Point Total					2.2E-06					5.5E-02
Outdoor Air	Arsenic	--	9.1E-11	--	9.1E-11	Developmental, Cardiovascular, CNS	--	6.2E-05	--	6.2E-05
Exposure Point Total					9.1E-11					6.2E-05
Total					**2.2E-06**					**5.5E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

Target Organ	Background Soil
Cardiovascular	6.2E-05
CNS	6.2E-05
Developmental	6.2E-05
Skin	5.5E-02

TABLE G2-7.2.4
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	9.5E+00	4.7E-06	4.5E-05	3.0E-04	1.4E-05	4.6E-02
	Dermal	Arsenic	1.0E+01	9.5E+00	5.6E-07	5.3E-06	3.0E-04	1.6E-06	5.5E-03
Exposure Point Total						5.0E-05			5.1E-02
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.2E+01	7.1E-10	8.5E-09	8.6E-06	2.1E-09	2.4E-04
Exposure Point Total						8.5E-09			2.4E-04
Total						**5.0E-05**			**5.1E-02**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.2.4
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	4.5E-05	--	5.3E-06	5.0E-05	Skin	4.6E-02	--	5.5E-03	5.1E-02
Exposure Point Total					5.0E-05					5.1E-02
Outdoor Air	Arsenic	--	8.5E-09	--	8.5E-09	Developmental, Cardiovascular, CNS	--	2.4E-04	--	2.4E-04
Exposure Point Total					8.5E-09					2.4E-04
Total					**5.0E-05**					**5.1E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	2.4E-04
CNS	2.4E-04
Developmental	2.4E-04
Skin	5.1E-02

TABLE G2-7.2.5
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Child

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	9.5E+00	1.1E-05	1.0E-04	3.0E-04	1.3E-04	4.3E-01
	Dermal	Arsenic	1.0E+01	9.5E+00	9.5E-07	9.1E-06	3.0E-04	1.1E-05	3.7E-02
Exposure Point Total						1.1E-04			4.6E-01
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.2E+01	4.2E-10	5.0E-09	8.6E-06	4.8E-09	5.6E-04
Exposure Point Total						5.0E-09			5.6E-04
Total						**1.1E-04**			**4.6E-01**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.2.5
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Child

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	1.0E-04	--	9.1E-06	1.1E-04	Skin	4.3E-01	--	3.7E-02	4.6E-01
Exposure Point Total					1.1E-04					4.6E-01
Outdoor Air	Arsenic	--	5.0E-09	--	5.0E-09	Developmental, Cardiovascular, CNS	--	5.6E-04	--	5.6E-04
Exposure Point Total					5.0E-09					5.6E-04
Total					**1.1E-04**					**4.6E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	5.6E-04
CNS	5.6E-04
Developmental	5.6E-04
Skin	4.6E-01

TABLE G2-7.2.6
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

				Cancer Risk			Noncancer Hazard Quotient		
Exposure Point	**Exposure Route**	**COPC**	**EPC (mg/kg)**	**CSF (mg/kg-day)$^{-1}$**	**Intake/ Exposure Concentration (mg/kg-day)**	**Cancer Risk**	**RfD (mg/kg-day)**	**Intake/ Exposure Concentration (mg/kg-day)**	**Hazard Quotient**
Background Soil	Ingestion	Arsenic	1.0E+01	9.5E+00	1.6E-05	1.5E-04	3.0E-04	1.3E-04	4.3E-01
	Dermal	Arsenic	1.0E+01	9.5E+00	1.5E-06	1.4E-05	3.0E-04	1.1E-05	3.7E-02
Exposure Point Total						1.6E-04			4.6E-01
Outdoor Air	Inhalation (Partculates)	Arsenic	1.0E+01	1.2E+01	1.1E-09	1.4E-08	8.6E-06	4.8E-09	5.6E-04
Exposure Point Total						1.4E-08			5.6E-04
Total						**1.6E-04**			**4.6E-01**

Notes:

--	Not available or not applicable
COPC	Chemical of potential concern
CSF	Cancer slope factor
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
(mg/kg-day)-1	1/(Milligram per kilogram per day)
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference dose
RME	Reasonable maximum exposure

TABLE G2-8.2.6
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, BACKGROUND RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Point	COPC	Cancer Risk				Noncancer Hazard Quotient				
		Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Background Soil	Arsenic	1.5E-04	--	1.4E-05	1.6E-04	Skin	4.3E-01	--	3.7E-02	4.6E-01
Exposure Point Total					1.6E-04					4.6E-01
Outdoor Air	Arsenic	--	1.4E-08	--	1.4E-08	Developmental, Cardiovascular, CNS	--	5.6E-04	--	5.6E-04
Exposure Point Total					1.4E-08					5.6E-04
Total					**1.6E-04**					**4.6E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices	
Target Organ	Background Soil
Cardiovascular	5.6E-04
CNS	5.6E-04
Developmental	5.6E-04
Skin	4.6E-01

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
18	incremental risk evaluation	Section 2.5.1	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix G: Attachment G3. Tetra Tech. June 1, 2009.

ATTACHMENT G3
EPA RAGS PART D TABLES 7 THROUGH 9 – INCREMENTAL RISK EVALUATION

(Tables to be provided on CD only)

TABLES

Chemical Cancer Risks and Noncancer Hazards, Federal Toxicity Criteria

G3-7.1.1 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Current Rancher

G3-8.1.1 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Current Rancher

G3-7.1.2 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G3-8.1.2 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G3-7.1.3 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Construction Worker

G3-8.1.3 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Construction Worker

G3-7.1.4 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult Resident

G3-8.1.4 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult Resident

G3-7.1.5 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Child Resident

G3-8.1.5 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Child Resident

G3-7.1.6 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult and Child Resident

G3-8.1.6 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, Federal Toxicity Criteria, Site 22A – Future Adult and Child Resident

Chemical Cancer Risks and Noncancer Hazards, State of California Toxicity Criteria

G3-7.2.1 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Rancher

G3-8.2.1 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Rancher

G3-7.2.2 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G3-8.2.2 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Industrial/Commercial Worker

G3-7.2.3 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Construction Worker

G3-8.2.3 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Construction Worker

G3-7.2.4 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult Resident

G3-8.2.4 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult Resident

G3-7.2.5 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Child Resident

G3-8.2.5 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Child Resident

G3-7.2.6 EPA RAGS Part D Table 7, Calculation of RME Chemical Cancer Risks and Noncancer Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult and Child Resident

G3-8.2.6 EPA RAGS Part D Table 9, Summary of Receptor Risks and Hazards, Incremental Risk Evaluation, State of California Toxicity Criteria, Site 22A – Future Adult and Child Resident

TABLE G3-7.1.1

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
								Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)			Surface Soil (0-0.5)		Subsurface Soil (0.5-10)		Surface and Subsurface Soil (0-10)	
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF (mg/kg-day)$^{-1}$	Intake/Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk	RfD (mg/kg-day)	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient	Intake/ Exposure Concentration (mg/kg-day)	Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NA	NA	1.5E+00	3.2E-07	4.8E-07	NA	NA	NA	NA	3.0E-04	9.0E-07	3.0E-03	NA	NA	NA	NA
		Dermal	Arsenic	8.3E+00			1.5E+00	1.1E-07	1.7E-07					3.0E-04	3.1E-07	1.0E-03				
	Exposure Point Total								6.5E-07							4.0E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.5E+01	2.1E-12	3.2E-11					8.6E-06	6.0E-12	7.0E-07				
	Exposure Point Total								3.2E-11							7.0E-07				
Exposure Medium Total - Group 2 Magazine Area									**6.5E-07**							**4.0E-03**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NA	NA	1.5E+00	6.6E-07	9.9E-07	NA	NA	NA	NA	3.0E-04	1.8E-06	6.1E-03	NA	NA	NA	NA
		Dermal	Arsenic	1.7E+01			1.5E+00	2.3E-07	3.4E-07					3.0E-04	6.3E-07	2.1E-03				
	Exposure Point Total								1.3E-06							8.2E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01			1.5E+01	4.4E-12	6.5E-11					8.6E-06	1.2E-11	1.4E-06				
	Exposure Point Total								6.5E-11							1.4E-06				
Exposure Medium Total - Group 3 Magazine Area									**1.3E-06**							**8.2E-03**				
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NA	NA	1.5E+00	4.6E-07	7.0E-07	NA	NA	NA	NA	3.0E-04	1.3E-06	4.3E-03	NA	NA	NA	NA
		Dermal	Arsenic	1.2E+01			1.5E+00	1.6E-07	2.4E-07					3.0E-04	4.5E-07	1.5E-03				
	Exposure Point Total								9.4E-07							5.8E-03				
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01			1.5E+01	3.1E-12	4.6E-11					8.6E-06	8.6E-12	1.0E-06				
	Exposure Point Total								4.6E-11							1.0E-06				
Exposure Medium Total - Group 4 Magazine Area									**9.4E-07**							**5.8E-03**				
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NA	NA	1.5E+00	8.7E-07	1.3E-06	NA	NA	NA	NA	3.0E-04	2.4E-06	8.1E-03	NA	NA	NA	NA
		Dermal	Arsenic	2.2E+01			1.5E+00	3.0E-07	4.4E-07					3.0E-04	8.3E-07	2.8E-03				
	Exposure Point Total								1.7E-06							1.1E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01			1.5E+01	5.7E-12	8.6E-11					8.6E-06	1.6E-11	1.9E-06				
	Exposure Point Total								8.6E-11							1.9E-06				
Exposure Medium Total - Group 5 Magazine Area									**1.7E-06**							**1.1E-02**				

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NA	Not applicable - no complete exposure pathways for this depth interval for this receptor	RME	Reasonable maximum exposure
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	NE	Not evaluated - concentration not above background concentration		
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RAGS	Risk Assessment Guidance for Superfund		
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RfD	Reference dose		

TABLE G3-8.1.1

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																										
Group 2	Site Soil	Arsenic	4.8E-07	--	1.7E-07	6.5E-07	NA				NA				Skin	3.0E-03	--	1.0E-03	4.0E-03	NA				NA			
	Exposure Point Total					6.5E-07													4.0E-03								
	Outdoor Air	Arsenic	--	3.2E-11	--	3.2E-11									Developmental, Cardiovascular, CNS	--	7.0E-07	--	7.0E-07								
	Exposure Point Total					3.2E-11													7.0E-07								
Exposure Medium Total - Group 2 Magazine Area						**6.5E-07**													**4.0E-03**								
Group 3	Site Soil	Arsenic	9.9E-07	--	3.4E-07	1.3E-06	NA				NA				Skin	6.1E-03	--	2.1E-03	8.2E-03	NA				NA			
	Exposure Point Total					1.3E-06													8.2E-03								
	Outdoor Air	Arsenic	--	6.5E-11	--	6.5E-11									Developmental, Cardiovascular, CNS	--	1.4E-06	--	1.4E-06								
	Exposure Point Total					6.5E-11													1.4E-06								
Exposure Medium Total - Group 3 Magazine Area						**1.3E-06**													**8.2E-03**								
Group 4	Site Soil	Arsenic	7.0E-07	--	2.4E-07	9.4E-07	NA				NA				Skin	4.3E-03	--	1.5E-03	5.8E-03	NA				NA			
	Exposure Point Total					9.4E-07													5.8E-03								
	Outdoor Air	Arsenic	--	4.6E-11	--	4.6E-11									Developmental, Cardiovascular, CNS	--	1.0E-06	--	1.0E-06								
	Exposure Point Total					4.6E-11													1.0E-06								
Exposure Medium Total - Group 4 Magazine Area						**9.4E-07**													**5.8E-03**								
Group 5	Site Soil	Arsenic	1.3E-06	--	4.4E-07	1.7E-06	NA				NA				Skin	8.1E-03	--	2.8E-03	1.1E-02	NA				NA			
	Exposure Point Total					1.7E-06													1.1E-02								
	Outdoor Air	Arsenic	--	8.6E-11	--	8.6E-11									Developmental, Cardiovascular, CNS	--	1.9E-06	--	1.9E-06								
	Exposure Point Total					8.6E-11													1.9E-06								
Exposure Medium Total - Group 5 Magazine Area						**1.7E-06**													**1.1E-02**								

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
NA	Not applicable - no complete exposure pathways for this depth interval for this receptor
NE	Not evaluated - concentration not above background concentration
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	0.0E+00	--	--	7.0E-07	--	--	1.4E-06	--	--	1.0E-06	--	--	1.9E-06	--	--
CNS	0.0E+00	--	--	7.0E-07	--	--	1.4E-06	--	--	1.0E-06	--	--	1.9E-06	--	--
Developmental	0.0E+00	--	--	7.0E-07	--	--	1.4E-06	--	--	1.0E-06	--	--	1.9E-06	--	--
Skin	0.0E+00	--	--	4.0E-03	--	--	8.2E-03	--	--	5.8E-03	--	--	1.1E-02	--	--

TABLE G3-7.1.2
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER
Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0 10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0 10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	1.5E+00	2.9E-06	4.3E-06	NE	NE	NE	NE	3.0E-04	8.1E-06	2.7E-02	NE	NE	NE	NE
		Dermal	Arsenic	8.3E+00			1.5E+00	9.9E-07	1.5E-06					3.0E-04	2.8E-06	9.2E-03				
	Exposure Point Total								5.8E-06							3.6E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.5E+01	3.1E-10	4.6E-09					8.6E-06	8.6E-10	1.0E-04				
	Exposure Point Total								4.6E-09							1.0E-04				
Exposure Medium Total - Group 2 Magazine Area									**5.8E-06**							**3.6E-02**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	1.5E+00	5.9E-06	8.8E-06	NE	7.2E-06	1.1E-05	3.0E-04	1.6E-05	5.5E-02	NE	2.0E-05	6.7E-02		
		Dermal	Arsenic	1.7E+01		2.1E+01	1.5E+00	2.0E-06	3.0E-06		2.5E-06	3.7E-06	3.0E-04	5.6E-06	1.9E-02		6.9E-06	2.3E-02		
	Exposure Point Total								1.2E-05			1.4E-05			7.4E-02			9.0E-02		
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.5E+01	6.2E-10	9.3E-09		7.6E-10	1.1E-08	8.6E-06	1.7E-09	2.0E-04		2.1E-09	2.5E-04		
	Exposure Point Total								9.3E-09			1.1E-08			2.0E-04			2.5E-04		
Exposure Medium Total - Group 3 Magazine Area									**1.2E-05**			**1.5E-05**			**7.4E-02**			**9.0E-02**		
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	1.5E+00	4.2E-06	6.2E-06	NE	3.9E-06	5.8E-06	3.0E-04	1.2E-05	3.9E-02	NE	1.1E-05	3.6E-02		
		Dermal	Arsenic	1.2E+01		1.1E+01	1.5E+00	1.4E-06	2.1E-06		1.3E-06	2.0E-06	3.0E-04	4.0E-06	1.3E-02		3.7E-06	1.2E-02		
	Exposure Point Total								8.4E-06			7.8E-06			5.2E-02			4.9E-02		
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.5E+01	4.4E-10	6.6E-09		4.1E-10	6.2E-09	8.6E-06	1.2E-09	1.4E-04		1.2E-09	1.3E-04		
	Exposure Point Total								6.6E-09			6.2E-09			1.4E-04			1.3E-04		
Exposure Medium Total - Group 4 Magazine Area									**8.4E-06**			**7.8E-06**			**5.2E-02**			**4.9E-02**		
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	1.5E+00	7.7E-06	1.2E-05	NE	5.9E-06	8.9E-06	3.0E-04	2.2E-05	7.2E-02	NE	1.7E-05	5.5E-02		
		Dermal	Arsenic	2.2E+01		1.7E+01	1.5E+00	2.6E-06	4.0E-06		2.0E-06	3.0E-06	3.0E-04	7.4E-06	2.5E-02		5.7E-06	1.9E-02		
	Exposure Point Total								1.6E-05			1.2E-05			9.7E-02			7.4E-02		
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.5E+01	8.2E-10	1.2E-08		6.3E-10	9.4E-09	8.6E-06	2.3E-09	2.7E-04		1.8E-09	2.0E-04		
	Exposure Point Total								1.2E-08			9.4E-09			2.7E-04			2.0E-04		
Exposure Medium Total - Group 5 Magazine Area									**1.6E-05**			**1.2E-05**			**9.7E-02**			**7.4E-02**		

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.1.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																									
Group 2	Site Soil	Arsenic	4.3E-06	--	1.5E-06	5.8E-06	NE				NE				Skin	2.7E-02	--	9.2E-03	3.6E-02	NE				NE			
	Exposure Point Total					5.8E-06													3.6E-02								
	Outdoor Air	Arsenic	--	4.6E-09	--	4.6E-09									Developmental, Cardiovascular, CNS	--	1.0E-04	--	1.0E-04								
	Exposure Point Total					4.6E-09													1.0E-04								
Exposure Medium Total - Group 2 Magazine Area						**5.8E-06**													**3.6E-02**								
Group 3	Site Soil	Arsenic	8.8E-06	--	3.0E-06	1.2E-05	NE				1.1E-05	--	3.7E-06	1.4E-05	Skin	5.5E-02	--	1.9E-02	7.4E-02	NE				6.7E-02	--	2.3E-02	9.0E-02
	Exposure Point Total					1.2E-05								1.4E-05					7.4E-02								9.0E-02
	Outdoor Air	Arsenic	--	9.3E-09	--	9.3E-09					--	1.1E-08	--	1.1E-08	Developmental, Cardiovascular, CNS	--	2.0E-04	--	2.0E-04					--	2.5E-04	--	2.5E-04
	Exposure Point Total					9.3E-09								1.1E-08					2.0E-04								2.5E-04
Exposure Medium Total - Group 3 Magazine Area						**1.2E-05**								**1.5E-05**					**7.4E-02**								**9.0E-02**
Group 4	Site Soil	Arsenic	6.2E-06	--	2.1E-06	8.4E-06	NE				5.8E-06	--	2.0E-06	7.8E-06	Skin	3.9E-02	--	1.3E-02	5.2E-02	NE				3.6E-02	--	1.2E-02	4.9E-02
	Exposure Point Total					8.4E-06								7.8E-06					5.2E-02								4.9E-02
	Outdoor Air	Arsenic	--	6.6E-09	--	6.6E-09					--	6.2E-09	--	6.2E-09	Developmental, Cardiovascular, CNS	--	1.4E-04	--	1.4E-04					--	1.3E-04	--	1.3E-04
	Exposure Point Total					6.6E-09								6.2E-09					1.4E-04								1.3E-04
Exposure Medium Total - Group 4 Magazine Area						**8.4E-06**								**7.8E-06**					**5.2E-02**								**4.9E-02**
Group 5	Site Soil	Arsenic	1.2E-05	--	4.0E-06	1.6E-05	NE				8.9E-06	--	3.0E-06	1.2E-05	Skin	7.2E-02	--	2.5E-02	9.7E-02	NE				5.5E-02	--	1.9E-02	7.4E-02
	Exposure Point Total					1.6E-05								1.2E-05					9.7E-02								7.4E-02
	Outdoor Air	Arsenic	--	1.2E-08	--	1.2E-08					--	9.4E-09	--	9.4E-09	Developmental, Cardiovascular, CNS	--	2.7E-04	--	2.7E-04					--	2.0E-04	--	2.0E-04
	Exposure Point Total					1.2E-08								9.4E-09					2.7E-04								2.0E-04
Exposure Medium Total - Group 5 Magazine Area						**1.6E-05**								**1.2E-05**					**9.7E-02**								**7.4E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
NE	Not evaluated - concentration not above background concentration
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	1.0E-04	--	--	2.0E-04	--	2.5E-04	1.4E-04	--	1.3E-04	2.7E-04	--	2.0E-04
CNS	--	--	--	1.0E-04	--	--	2.0E-04	--	2.5E-04	1.4E-04	--	1.3E-04	2.7E-04	--	2.0E-04
Developmental	--	--	--	1.0E-04	--	--	2.0E-04	--	2.5E-04	1.4E-04	--	1.3E-04	2.7E-04	--	2.0E-04
Skin	--	--	--	3.6E-02	--	--	7.4E-02	--	9.0E-02	5.2E-02	--	4.9E-02	9.7E-02	--	7.4E-02

TABLE G3-7.1.3
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF $(mg/kg\text{-}day)^{-1}$	Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Surface Soil (0-0.5) Cancer Risk	Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Subsurface Soil (0.5-10) Cancer Risk	Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Surface and Subsurface Soil (0-10) Cancer Risk	RfD (mg/kg-day)	Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Surface Soil (0-0.5) Hazard Quotient	Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Subsurface Soil (0.5-10) Hazard Quotient	Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	1.5E+00	1.4E-07	2.1E-07	NE	NE	NE	NE	3.0E-04	9.6E-06	3.2E-02	NE	NE	NE	NE
		Dermal	Arsenic	8.3E+00			1.5E+00	5.7E-08	8.5E-08					3.0E-04	4.0E-06	1.3E-02				
	Exposure Point Total								2.9E-07							4.5E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.5E+01	8.3E-09	1.2E-07					8.6E-06	5.8E-07	6.8E-02				
	Exposure Point Total								1.2E-07							6.8E-02				
Exposure Medium Total - Group 2 Magazine Area									**4.2E-07**							**1.1E-01**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	1.5E+00	2.8E-07	4.2E-07	NE	3.4E-07	5.1E-07	NE	3.0E-04	2.0E-05	6.5E-02	NE	2.4E-05	8.0E-02	NE
		Dermal	Arsenic	1.7E+01		2.1E+01	1.5E+00	1.2E-07	1.7E-07		1.4E-07	2.1E-07		3.0E-04	8.1E-06	2.7E-02		9.9E-06	3.3E-02	
	Exposure Point Total								5.9E-07			7.3E-07				9.2E-02			1.1E-01	
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.5E+01	1.7E-08	2.5E-07		2.1E-08	3.1E-07		8.6E-06	1.2E-06	1.4E-01		1.5E-06	1.7E-01	
	Exposure Point Total								2.5E-07			3.1E-07				1.4E-01			1.7E-01	
Exposure Medium Total - Group 3 Magazine Area									**8.5E-07**			**1.0E-06**				**2.3E-01**			**2.8E-01**	
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	1.5E+00	2.0E-07	3.0E-07	NE	1.9E-07	2.8E-07	NE	3.0E-04	1.4E-05	4.6E-02	NE	1.3E-05	4.3E-02	NE
		Dermal	Arsenic	1.2E+01		1.1E+01	1.5E+00	8.2E-08	1.2E-07		7.7E-08	1.2E-07		3.0E-04	5.7E-06	1.9E-02		5.4E-06	1.8E-02	
	Exposure Point Total								4.2E-07			3.9E-07				6.5E-02			6.1E-02	
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.5E+01	1.2E-08	1.8E-07		1.1E-08	1.7E-07		8.6E-06	8.4E-07	9.7E-02		7.9E-07	9.1E-02	
	Exposure Point Total								1.8E-07			1.7E-07				9.7E-02			9.1E-02	
Exposure Medium Total - Group 4 Magazine Area									**6.0E-07**			**5.6E-07**				**1.6E-01**			**1.5E-01**	
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	1.5E+00	3.7E-07	5.5E-07	NE	2.8E-07	4.2E-07	NE	3.0E-04	2.6E-05	8.6E-02	NE	2.0E-05	6.6E-02	NE
		Dermal	Arsenic	2.2E+01		1.7E+01	1.5E+00	1.5E-07	2.3E-07		1.2E-07	1.7E-07		3.0E-04	1.1E-05	3.6E-02		8.1E-06	2.7E-02	
	Exposure Point Total								7.8E-07			6.0E-07				1.2E-01			9.3E-02	
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.5E+01	2.2E-08	3.3E-07		1.7E-08	2.6E-07		8.6E-06	1.6E-06	1.8E-01		1.2E-06	1.4E-01	
	Exposure Point Total								3.3E-07			2.6E-07				1.8E-01			1.4E-01	
Exposure Medium Total - Group 5 Magazine Area									**1.1E-06**			**8.5E-07**				**3.0E-01**			**2.3E-01**	

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.1.3

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																									
Group 2	Site Soil	Arsenic	2.1E-07	--	8.5E-08	2.9E-07	NE				NE				Skin	3.2E-02	--	1.3E-02	4.5E-02	NE				NE			
	Exposure Point Total					2.9E-07													4.5E-02								
	Outdoor Air	Arsenic	--	1.2E-07	--	1.2E-07									Developmental, Cardiovascular, CNS	--	6.8E-02	--	6.8E-02								
	Exposure Point Total					1.2E-07													6.8E-02								
Exposure Medium Total - Group 2 Magazine Area						**4.2E-07**													**1.1E-01**								
Group 3	Site Soil	Arsenic	4.2E-07	--	1.7E-07	5.9E-07	NE				5.1E-07	--	2.1E-07	7.3E-07	Skin	6.5E-02	--	2.7E-02	9.2E-02	NE				8.0E-02	--	3.3E-02	1.1E-01
	Exposure Point Total					5.9E-07								7.3E-07					9.2E-02								1.1E-01
	Outdoor Air	Arsenic	--	2.5E-07	--	2.5E-07					--	3.1E-07	--	3.1E-07	Developmental, Cardiovascular, CNS	--	1.4E-01	--	1.4E-01					--	1.7E-01	--	1.7E-01
	Exposure Point Total					2.5E-07								3.1E-07					1.4E-01								1.7E-01
Exposure Medium Total - Group 3 Magazine Area						**8.5E-07**								**1.0E-06**					**2.3E-01**								**2.8E-01**
Group 4	Site Soil	Arsenic	3.0E-07	--	1.2E-07	4.2E-07	NE				2.8E-07	--	1.2E-07	3.9E-07	Skin	4.6E-02	--	1.9E-02	6.5E-02	NE				4.3E-02	--	1.8E-02	6.1E-02
	Exposure Point Total					4.2E-07								3.9E-07					6.5E-02								6.1E-02
	Outdoor Air	Arsenic	--	1.8E-07	--	1.8E-07					--	1.7E-07	--	1.7E-07	Developmental, Cardiovascular, CNS	--	9.7E-02	--	9.7E-02					--	9.1E-02	--	9.1E-02
	Exposure Point Total					1.8E-07								1.7E-07					9.7E-02								9.1E-02
Exposure Medium Total - Group 4 Magazine Area						**6.0E-07**								**5.6E-07**					**1.6E-01**								**1.5E-01**
Group 5	Site Soil	Arsenic	5.5E-07	--	2.3E-07	7.8E-07	NE				4.2E-07	--	1.7E-07	6.0E-07	Skin	8.6E-02	--	3.6E-02	1.2E-01	NE				6.6E-02	--	2.7E-02	9.3E-02
	Exposure Point Total					7.8E-07								6.0E-07					1.2E-01								9.3E-02
	Outdoor Air	Arsenic	--	3.3E-07	--	3.3E-07					--	2.6E-07	--	2.6E-07	Developmental, Cardiovascular, CNS	--	1.8E-01	--	1.8E-01					--	1.4E-01	--	1.4E-01
	Exposure Point Total					3.3E-07								2.6E-07					1.8E-01								1.4E-01
Exposure Medium Total - Group 5 Magazine Area						**1.1E-06**								**8.5E-07**					**3.0E-01**								**2.3E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	6.8E-02	--	--	1.4E-01	--	1.7E-01	9.7E-02	--	9.1E-02	1.8E-01	--	1.4E-01
CNS	--	--	--	6.8E-02	--	--	1.4E-01	--	1.7E-01	9.7E-02	--	9.1E-02	1.8E-01	--	1.4E-01
Developmental	--	--	--	6.8E-02	--	--	1.4E-01	--	1.7E-01	9.7E-02	--	9.1E-02	1.8E-01	--	1.4E-01
Skin	--	--	--	4.5E-02	--	--	9.2E-02	--	1.1E-01	6.5E-02	--	6.1E-02	1.2E-01	--	9.3E-02

TABLE G3-7.1.4

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	1.5E+00	3.9E-06	5.8E-06	NE		NE		3.0E-04	1.1E-05	3.8E-02	NE		NE	
		Dermal	Arsenic	8.3E+00			1.5E+00	4.6E-07	7.0E-07					3.0E-04	1.4E-06	4.5E-03				
	Exposure Point Total								6.5E-06							4.2E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.5E+01	5.9E-10	8.8E-09					8.6E-06	1.7E-09	2.0E-04				
	Exposure Point Total								8.8E-09							2.0E-04				
Exposure Medium Total - Group 2 Magazine Area									**6.5E-06**							**4.2E-02**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	1.5E+00	7.9E-06	1.2E-05	NE		9.7E-06	1.5E-05	3.0E-04	2.3E-05	7.7E-02	NE		2.8E-05	9.4E-02
		Dermal	Arsenic	1.7E+01		2.1E+01	1.5E+00	9.5E-07	1.4E-06			1.2E-06	1.7E-06	3.0E-04	2.8E-06	9.2E-03			3.4E-06	1.1E-02
	Exposure Point Total								1.3E-05				1.6E-05			8.6E-02				1.1E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.5E+01	1.2E-09	1.8E-08			1.5E-09	2.2E-08	8.6E-06	3.5E-09	4.1E-04			4.3E-09	5.0E-04
	Exposure Point Total								1.8E-08				2.2E-08			4.1E-04				5.0E-04
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	1.5E+00	5.6E-06	8.4E-06	NE		5.2E-06	7.9E-06	3.0E-04	1.6E-05	5.4E-02	NE		1.5E-05	5.1E-02
		Dermal	Arsenic	1.2E+01		1.1E+01	1.5E+00	6.7E-07	1.0E-06			6.3E-07	9.4E-07	3.0E-04	1.9E-06	6.5E-03			1.8E-06	6.1E-03
	Exposure Point Total								9.4E-06				8.8E-06			6.1E-02				5.7E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.5E+01	8.5E-10	1.3E-08			7.9E-10	1.2E-08	8.6E-06	2.5E-09	2.9E-04			2.3E-09	2.7E-04
	Exposure Point Total								1.3E-08				1.2E-08			2.9E-04				2.7E-04
									9.4E-06				**8.8E-06**			**6.1E-02**				**5.7E-02**
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	1.5E+00	1.0E-05	1.6E-05	NE		7.9E-06	1.2E-05	3.0E-04	3.0E-05	1.0E-01	NE		2.3E-05	7.7E-02
		Dermal	Arsenic	2.2E+01		1.7E+01	1.5E+00	1.2E-06	1.9E-06			9.5E-07	1.4E-06	3.0E-04	3.6E-06	1.2E-02			2.8E-06	9.2E-03
	Exposure Point Total								1.7E-05				1.3E-05			1.1E-01				8.6E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.5E+01	1.6E-09	2.4E-08			1.2E-09	1.8E-08	8.6E-06	4.6E-09	5.3E-04			3.5E-09	4.1E-04
	Exposure Point Total								2.4E-08				1.8E-08			5.3E-04				4.1E-04
									1.7E-05				**1.3E-05**			**1.1E-01**				**8.7E-02**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.1.4

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																										
Group 2	Site Soil	Arsenic	5.8E-06	--	7.0E-07	6.5E-06	NE				NE				Skin	3.8E-02	--	4.5E-03	4.2E-02	NE				NE			
	Exposure Point Total					6.5E-06													4.2E-02								
	Outdoor Air	Arsenic	--	8.8E-09	--	8.8E-09									Developmental, Cardiovascular, CNS	--	2.0E-04	--	2.0E-04								
	Exposure Point Total					8.8E-09													2.0E-04								
Exposure Medium Total - Group 2 Magazine Area						**6.5E-06**													**4.2E-02**								
Group 3	Site Soil	Arsenic	1.2E-05	--	1.4E-06	1.3E-05	NE				1.5E-05	--	1.7E-06	1.6E-05	Skin	7.7E-02	--	9.2E-03	8.6E-02	NE				9.4E-02	--	1.1E-02	1.1E-01
	Exposure Point Total					1.3E-05								1.6E-05					8.6E-02								1.1E-01
	Outdoor Air	Arsenic	--	1.8E-08	--	1.8E-08					--	2.2E-08	--	2.2E-08	Developmental, Cardiovascular, CNS	--	4.1E-04	--	4.1E-04					--	5.0E-04	--	5.0E-04
	Exposure Point Total					1.8E-08								2.2E-08					4.1E-04								5.0E-04
Exposure Medium Total - Group 3 Magazine Area						**1.3E-05**								**1.6E-05**					**8.6E-02**								**1.1E-01**
Group 4	Site Soil	Arsenic	8.4E-06	--	1.0E-06	9.4E-06	NE				7.9E-06	--	9.4E-07	8.8E-06	Skin	5.4E-02	--	6.5E-03	6.1E-02	NE				5.1E-02	--	6.1E-03	5.7E-02
	Exposure Point Total					9.4E-06								8.8E-06					6.1E-02								5.7E-02
	Outdoor Air	Arsenic	--	1.3E-08	--	1.3E-08					--	1.2E-08	--	1.2E-08	Developmental, Cardiovascular, CNS	--	2.9E-04	--	2.9E-04					--	2.7E-04	--	2.7E-04
	Exposure Point Total					1.3E-08								1.2E-08					2.9E-04								2.7E-04
Exposure Medium Total - Group 4 Magazine Area						**9.4E-06**								**8.8E-06**					**6.1E-02**								**5.7E-02**
Group 5	Site Soil	Arsenic	1.6E-05	--	1.9E-06	1.7E-05	NE				1.2E-05	--	1.4E-06	1.3E-05	Skin	1.0E-01	--	1.2E-02	1.1E-01	NE				7.7E-02	--	9.2E-03	8.6E-02
	Exposure Point Total					1.7E-05								1.3E-05					1.1E-01								8.6E-02
	Outdoor Air	Arsenic	--	2.4E-08	--	2.4E-08					--	1.8E-08	--	1.8E-08	Developmental, Cardiovascular, CNS	--	5.3E-04	--	5.3E-04					--	4.1E-04	--	4.1E-04
	Exposure Point Total					2.4E-08								1.8E-08					5.3E-04								4.1E-04
Exposure Medium Total - Group 5 Magazine Area						**1.7E-05**								**1.3E-05**					**1.1E-01**								**8.7E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	2.0E-04	--	--	4.1E-04	--	5.0E-04	2.9E-04	--	2.7E-04	5.3E-04	--	4.1E-04
CNS	--	--	--	2.0E-04	--	--	4.1E-04	--	5.0E-04	2.9E-04	--	2.7E-04	5.3E-04	--	4.1E-04
Developmental	--	--	--	2.0E-04	--	--	4.1E-04	--	5.0E-04	2.9E-04	--	2.7E-04	5.3E-04	--	4.1E-04
Skin	--	--	--	4.2E-02	--	--	8.6E-02	--	1.1E-01	6.1E-02	--	5.7E-02	1.1E-01	--	8.6E-02

TABLE G3-7.1.5

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	1.5E+00	9.0E-06	1.4E-05	NE		NE		3.0E-04	1.1E-04	3.5E-01	NE		NE	
		Dermal	Arsenic	8.3E+00			1.5E+00	7.9E-07	1.2E-06					3.0E-04	9.2E-06	3.1E-02				
	Exposure Point Total								1.5E-05							3.8E-01				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.5E+01	3.4E-10	5.1E-09					8.6E-06	4.0E-09	4.6E-04				
	Exposure Point Total								5.1E-09							4.6E-04				
Exposure Medium Total - Group 2 Magazine Area									**1.5E-05**							**3.8E-01**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	1.5E+00	1.8E-05	2.8E-05	NE		2.3E-05	3.4E-05	3.0E-04	2.1E-04	7.2E-01	NE		2.6E-04	8.8E-01
		Dermal	Arsenic	1.7E+01		2.1E+01	1.5E+00	1.6E-06	2.4E-06			2.0E-06	2.9E-06	3.0E-04	1.9E-05	6.2E-02			2.3E-05	7.6E-02
	Exposure Point Total								3.0E-05				3.7E-05			7.8E-01				9.5E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.5E+01	7.0E-10	1.0E-08			8.6E-10	1.3E-08	8.6E-06	8.1E-09	9.5E-04			1.0E-08	1.2E-03
	Exposure Point Total								1.0E-08				1.3E-08			9.5E-04				1.2E-03
Exposure Medium Total - Group 3 Magazine Area									**3.0E-05**				**3.7E-05**			**7.8E-01**				**9.6E-01**
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	1.5E+00	1.3E-05	2.0E-05	NE		1.2E-05	1.8E-05	3.0E-04	1.5E-04	5.1E-01	NE		1.4E-04	4.8E-01
		Dermal	Arsenic	1.2E+01		1.1E+01	1.5E+00	1.1E-06	1.7E-06			1.1E-06	1.6E-06	3.0E-04	1.3E-05	4.4E-02			1.2E-05	4.1E-02
	Exposure Point Total								2.1E-05				2.0E-05			5.5E-01				5.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.5E+01	4.9E-10	7.4E-09			4.6E-10	6.9E-09	8.6E-06	5.8E-09	6.7E-04			5.4E-09	6.3E-04
	Exposure Point Total								7.4E-09				6.9E-09			6.7E-04				6.3E-04
Exposure Medium Total - Group 4 Magazine Area									**2.1E-05**				**2.0E-05**			**5.5E-01**				**5.2E-01**
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	1.5E+00	2.4E-05	3.6E-05	NE		1.9E-05	2.8E-05	3.0E-04	2.8E-04	9.4E-01	NE		2.2E-04	7.2E-01
		Dermal	Arsenic	2.2E+01		1.7E+01	1.5E+00	2.1E-06	3.2E-06			1.6E-06	2.4E-06	3.0E-04	2.5E-05	8.2E-02			1.9E-05	6.3E-02
	Exposure Point Total								4.0E-05				3.0E-05			1.0E+00				7.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.5E+01	9.2E-10	1.4E-08			7.0E-10	1.1E-08	8.6E-06	1.1E-08	1.2E-03			8.2E-09	9.5E-04
	Exposure Point Total								1.4E-08				1.1E-08			1.2E-03				9.5E-04
Exposure Medium Total - Group 5 Magazine Area									**4.0E-05**				**3.0E-05**			**1.0E+00**				**7.8E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.1.5

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																										
Group 2	Site Soil	Arsenic	1.4E-05	--	1.2E-06	1.5E-05	NE				NE				Skin	3.5E-01	--	3.1E-02	3.8E-01	NE				NE			
	Exposure Point Total					1.5E-05													3.8E-01								
	Outdoor Air	Arsenic	--	5.1E-09	--	5.1E-09									Developmental, Cardiovascular, CNS	--	4.6E-04	--	4.6E-04								
	Exposure Point Total					5.1E-09													4.6E-04								
Exposure Medium Total - Group 2 Magazine Area						**1.5E-05**													**3.8E-01**								
Group 3	Site Soil	Arsenic	2.8E-05	--	2.4E-06	3.0E-05	NE				3.4E-05	--	2.9E-06	3.7E-05	Skin	7.2E-01	--	6.2E-02	7.8E-01	NE				8.8E-01	--	7.6E-02	9.5E-01
	Exposure Point Total					3.0E-05								3.7E-05					7.8E-01								9.5E-01
	Outdoor Air	Arsenic	--	1.0E-08	--	1.0E-08					--	1.3E-08	--	1.3E-08	Developmental, Cardiovascular, CNS	--	9.5E-04	--	9.5E-04					--	1.2E-03	--	1.2E-03
	Exposure Point Total					1.0E-08								1.3E-08					9.5E-04								1.2E-03
Exposure Medium Total - Group 3 Magazine Area						**3.0E-05**								**3.7E-05**					**7.8E-01**								**9.6E-01**
Group 4	Site Soil	Arsenic	2.0E-05	--	1.7E-06	2.1E-05	NE				1.8E-05	--	1.6E-06	2.0E-05	Skin	5.1E-01	--	4.4E-02	5.5E-01	NE				4.8E-01	--	4.1E-02	5.2E-01
	Exposure Point Total					2.1E-05								2.0E-05					5.5E-01								5.2E-01
	Outdoor Air	Arsenic	--	7.4E-09	--	7.4E-09					--	6.9E-09	--	6.9E-09	Developmental, Cardiovascular, CNS	--	6.7E-04	--	6.7E-04					--	6.3E-04	--	6.3E-04
	Exposure Point Total					7.4E-09								6.9E-09					6.7E-04								6.3E-04
Exposure Medium Total - Group 4 Magazine Area						**2.1E-05**								**2.0E-05**					**5.5E-01**								**5.2E-01**
Group 5	Site Soil	Arsenic	3.6E-05	--	3.2E-06	4.0E-05	NE				2.8E-05	--	2.4E-06	3.0E-05	Skin	9.4E-01	--	8.2E-02	1.0E+00	NE				7.2E-01	--	6.3E-02	7.8E-01
	Exposure Point Total					4.0E-05								3.0E-05					1.0E+00								7.8E-01
	Outdoor Air	Arsenic	--	1.4E-08	--	1.4E-08					--	1.1E-08	--	1.1E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03					--	9.5E-04	--	9.5E-04
	Exposure Point Total					1.4E-08								1.1E-08					1.2E-03								9.5E-04
Exposure Medium Total - Group 5 Magazine Area						**4.0E-05**								**3.0E-05**					**1.0E+00**								**7.8E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
CNS	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Developmental	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Skin	--	--	--	3.8E-01	--	--	7.8E-01	--	9.5E-01	5.5E-01	--	5.2E-01	**1.0E+00**	--	7.8E-01

TABLE G3-7.1.6
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	1.5E+00	1.3E-05	1.9E-05	NE	NE	NE		3.0E-04	1.1E-04	3.5E-01	NE	NE	NE	
		Dermal	Arsenic	8.3E+00			1.5E+00	1.3E-06	1.9E-06					3.0E-04	9.2E-06	3.1E-02				
	Exposure Point Total								2.1E-05							3.8E-01				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.5E+01	9.3E-10	1.4E-08					8.6E-06	4.0E-09	4.6E-04				
	Exposure Point Total								1.4E-08							4.6E-04				
Exposure Medium Total - Group 2 Magazine Area									**2.1E-05**							**3.8E-01**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	1.5E+00	2.6E-05	3.9E-05	NE	3.2E-05	4.8E-05		3.0E-04	2.1E-04	7.2E-01	NE	2.6E-04	8.8E-01	
		Dermal	Arsenic	1.7E+01		2.1E+01	1.5E+00	2.5E-06	3.8E-06		3.1E-06	4.7E-06		3.0E-04	1.9E-05	6.2E-02		2.3E-05	7.6E-02	
	Exposure Point Total								4.3E-05			5.3E-05				7.8E-01			9.5E-01	
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.5E+01	1.9E-09	2.8E-08		2.3E-09	3.5E-08		8.6E-06	8.1E-09	9.5E-04		1.0E-08	1.2E-03	
	Exposure Point Total								2.8E-08			3.5E-08				9.5E-04			1.2E-03	
Exposure Medium Total - Group 3 Magazine Area									**4.3E-05**			**5.3E-05**				**7.8E-01**			**9.6E-01**	
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	1.5E+00	1.9E-05	2.8E-05	NE	1.7E-05	2.6E-05		3.0E-04	1.5E-04	5.1E-01	NE	1.4E-04	4.8E-01	
		Dermal	Arsenic	1.2E+01		1.1E+01	1.5E+00	1.8E-06	2.7E-06		1.7E-06	2.5E-06		3.0E-04	1.3E-05	4.4E-02		1.2E-05	4.1E-02	
	Exposure Point Total								3.1E-05			2.9E-05				5.5E-01			5.2E-01	
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.5E+01	1.3E-09	2.0E-08		1.3E-09	1.9E-08		8.6E-06	5.8E-09	6.7E-04		5.4E-09	6.3E-04	
	Exposure Point Total								2.0E-08			1.9E-08				6.7E-04			6.3E-04	
Exposure Medium Total - Group 4 Magazine Area									**3.1E-05**			**2.9E-05**				**5.5E-01**			**5.2E-01**	
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	1.5E+00	3.5E-05	5.2E-05	NE	2.6E-05	4.0E-05		3.0E-04	2.8E-04	9.4E-01	NE	2.2E-04	7.2E-01	
		Dermal	Arsenic	2.2E+01		1.7E+01	1.5E+00	3.4E-06	5.0E-06		2.6E-06	3.8E-06		3.0E-04	2.5E-05	8.2E-02		1.9E-05	6.3E-02	
	Exposure Point Total								5.7E-05			4.4E-05				1.0E+00			7.8E-01	
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.5E+01	2.5E-09	3.7E-08		1.9E-09	2.9E-08		8.6E-06	1.1E-08	1.2E-03		8.2E-09	9.5E-04	
	Exposure Point Total								3.7E-08			2.9E-08				1.2E-03			9.5E-04	
Exposure Medium Total - Group 5 Magazine Area									**5.7E-05**			**4.4E-05**				**1.0E+00**			**7.8E-01**	

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.1.6

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, FEDERAL TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																									
Group 2	Site Soil	Arsenic	1.9E-05	--	1.9E-06	2.1E-05	NE				NE				Skin	3.5E-01	--	3.1E-02	3.8E-01	NE				NE			
	Exposure Point Total					2.1E-05													3.8E-01								
	Outdoor Air	Arsenic	--	1.4E-08	--	1.4E-08									Developmental, Cardiovascular, CNS	--	4.6E-04	--	4.6E-04								
	Exposure Point Total					1.4E-08													4.6E-04								
Exposure Medium Total - Group 2 Magazine Area						**2.1E-05**													**3.8E-01**								
Group 3	Site Soil	Arsenic	3.9E-05	--	3.8E-06	4.3E-05	NE				4.8E-05	--	4.7E-06	5.3E-05	Skin	7.2E-01	--	6.2E-02	7.8E-01	NE				8.8E-01	--	7.6E-02	9.5E-01
	Exposure Point Total					4.3E-05								5.3E-05					7.8E-01								9.5E-01
	Outdoor Air	Arsenic	--	2.8E-08	--	2.8E-08					--	3.5E-08	--	3.5E-08	Developmental, Cardiovascular, CNS	--	9.5E-04	--	9.5E-04					--	1.2E-03	--	1.2E-03
	Exposure Point Total					2.8E-08								3.5E-08					9.5E-04								1.2E-03
Exposure Medium Total - Group 3 Magazine Area						**4.3E-05**								**5.3E-05**					**7.8E-01**								**9.6E-01**
Group 4	Site Soil	Arsenic	2.8E-05	--	2.7E-06	3.1E-05	NE				2.6E-05	--	2.5E-06	2.9E-05	Skin	5.1E-01	--	4.4E-02	5.5E-01	NE				4.8E-01	--	4.1E-02	5.2E-01
	Exposure Point Total					3.1E-05								2.9E-05					5.5E-01								5.2E-01
	Outdoor Air	Arsenic	--	2.0E-08	--	2.0E-08					--	1.9E-08	--	1.9E-08	Developmental, Cardiovascular, CNS	--	6.7E-04	--	6.7E-04					--	6.3E-04	--	6.3E-04
	Exposure Point Total					2.0E-08								1.9E-08					6.7E-04								6.3E-04
Exposure Medium Total - Group 4 Magazine Area						**3.1E-05**								**2.9E-05**					**5.5E-01**								**5.2E-01**
Group 5	Site Soil	Arsenic	5.2E-05	--	5.0E-06	5.7E-05	NE				4.0E-05	--	3.8E-06	4.4E-05	Skin	9.4E-01	--	8.2E-02	1.0E+00	NE				7.2E-01	--	6.3E-02	7.8E-01
	Exposure Point Total					5.7E-05								4.4E-05					1.0E+00								7.8E-01
	Outdoor Air	Arsenic	--	3.7E-08	--	3.7E-08					--	2.9E-08	--	2.9E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03					--	9.5E-04	--	9.5E-04
	Exposure Point Total					3.7E-08								2.9E-08					1.2E-03								9.5E-04
Exposure Medium Total - Group 5 Magazine Area						**5.7E-05**								**4.4E-05**					**1.0E+00**								**7.8E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
CNS	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Developmental	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Skin	--	--	--	3.8E-01	--	--	7.8E-01	--	9.5E-01	5.5E-01	--	5.2E-01	**1.0E+00**	--	7.8E-01

TABLE G3-7.2.1
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – CURRENT RANCHER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NA	NA	9.5E+00	3.2E-07	3.1E-06	NA	NA	3.0E-04	9.0E-07	3.0E-03	NA	NA				
		Dermal	Arsenic	8.3E+00			9.5E+00	1.1E-07	1.0E-06			3.0E-04	3.1E-07	1.0E-03						
	Exposure Point Total								4.1E-06					4.0E-03						
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.2E+01	2.1E-12	2.6E-11			8.6E-06	6.0E-12	7.0E-07						
	Exposure Point Total								2.6E-11					7.0E-07						
Exposure Medium Total - Group 2 Magazine Area									**4.1E-06**					**4.0E-03**						
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NA	NA	9.5E+00	6.6E-07	6.3E-06	NA	NA	3.0E-04	1.8E-06	6.1E-03	NA	NA				
		Dermal	Arsenic	1.7E+01			9.5E+00	2.3E-07	2.1E-06			3.0E-04	6.3E-07	2.1E-03						
	Exposure Point Total								8.4E-06					8.2E-03						
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01			1.2E+01	4.4E-12	5.2E-11			8.6E-06	1.2E-11	1.4E-06						
	Exposure Point Total								5.2E-11					1.4E-06						
Exposure Medium Total - Group 3 Magazine Area									**8.4E-06**					**8.2E-03**						
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NA	NA	9.5E+00	4.6E-07	4.4E-06	NA	NA	3.0E-04	1.3E-06	4.3E-03	NA	NA				
		Dermal	Arsenic	1.2E+01			9.5E+00	1.6E-07	1.5E-06			3.0E-04	4.5E-07	1.5E-03						
	Exposure Point Total								5.9E-06					5.8E-03						
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01			1.2E+01	3.1E-12	3.7E-11			8.6E-06	8.6E-12	1.0E-06						
	Exposure Point Total								3.7E-11					1.0E-06						
Exposure Medium Total - Group 4 Magazine Area									**5.9E-06**					**5.8E-03**						
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NA	NA	9.5E+00	8.7E-07	8.2E-06	NA	NA	3.0E-04	2.4E-06	8.1E-03	NA	NA				
		Dermal	Arsenic	2.2E+01			9.5E+00	3.0E-07	2.8E-06			3.0E-04	8.3E-07	2.8E-03						
	Exposure Point Total								1.1E-05					1.1E-02						
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01			1.2E+01	5.7E-12	6.9E-11			8.6E-06	1.6E-11	1.9E-06						
	Exposure Point Total								6.9E-11					1.9E-06						
Exposure Medium Total - Group 5 Magazine Area									**1.1E-05**					**1.1E-02**						

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NA	Not applicable - no complete exposure pathways for this depth interval for this receptor	RME	Reasonable maximum exposure
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	NE	Not evaluated - concentration not above background concentration		
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RAGS	Risk Assessment Guidance for Superfund		
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RfD	Reference dose		

TABLE G3-8.2.1
EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – CURRENT RANCHE
Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Current
Receptor Population:	Rancher
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																										
Group 2	Site Soil	Arsenic	3.1E-06	--	1.0E-06	4.1E-06	NA				NA				Skin	3.0E-03	--	1.0E-03	4.0E-03	NA				NA			
	Exposure Point Total					4.1E-06													4.0E-03								
	Outdoor Air	Arsenic	--	2.6E-11	--	2.6E-11									Developmental, Cardiovascular, CNS	--	7.0E-07	--	7.0E-07								
	Exposure Point Total					2.6E-11													7.0E-07								
Exposure Medium Total - Group 2 Magazine Area						**4.1E-06**													**4.0E-03**								
Group 3	Site Soil	Arsenic	6.3E-06	--	2.1E-06	8.4E-06	NA				NA				Skin	6.1E-03	--	2.1E-03	8.2E-03	NA				NA			
	Exposure Point Total					8.4E-06													8.2E-03								
	Outdoor Air	Arsenic	--	5.2E-11	--	5.2E-11									Developmental, Cardiovascular, CNS	--	1.4E-06	--	1.4E-06								
	Exposure Point Total					5.2E-11													1.4E-06								
Exposure Medium Total - Group 3 Magazine Area						**8.4E-06**													**8.2E-03**								
Group 4	Site Soil	Arsenic	4.4E-06	--	1.5E-06	5.9E-06	NA				NA				Skin	4.3E-03	--	1.5E-03	5.8E-03	NA				NA			
	Exposure Point Total					5.9E-06													5.8E-03								
	Outdoor Air	Arsenic	--	3.7E-11	--	3.7E-11									Developmental, Cardiovascular, CNS	--	1.0E-06	--	1.0E-06								
	Exposure Point Total					3.7E-11													1.0E-06								
Exposure Medium Total - Group 4 Magazine Area						**5.9E-06**													**5.8E-03**								
Group 5	Site Soil	Arsenic	8.2E-06	--	2.8E-06	1.1E-05	NA				NA				Skin	8.1E-03	--	2.8E-03	1.1E-02	NA				NA			
	Exposure Point Total					1.1E-05													1.1E-02								
	Outdoor Air	Arsenic	--	6.9E-11	--	6.9E-11									Developmental, Cardiovascular, CNS	--	1.9E-06	--	1.9E-06								
	Exposure Point Total					6.9E-11													1.9E-06								
Exposure Medium Total - Group 5 Magazine Area						**1.1E-05**													**1.1E-02**								

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
NA	Not applicable - no complete exposure pathways for this depth interval for this receptor
NE	Not evaluated - concentration not above background concentration
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	0.0E+00	--	--	7.0E-07	--	--	1.4E-06	--	--	1.0E-06	--	--	1.9E-06	--	--
CNS	0.0E+00	--	--	7.0E-07	--	--	1.4E-06	--	--	1.0E-06	--	--	1.9E-06	--	--
Developmental	0.0E+00	--	--	7.0E-07	--	--	1.4E-06	--	--	1.0E-06	--	--	1.9E-06	--	--
Skin	0.0E+00	--	--	4.0E-03	--	--	8.2E-03	--	--	5.8E-03	--	--	1.1E-02	--	--

TABLE G3-7.2.2
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER
Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0 10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0 10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	9.5E+00	2.9E-06	2.7E-05	NE	NE	3.0E-04	8.1E-06	2.7E-02	NE		NE		NE	
		Dermal	Arsenic	8.3E+00			9.5E+00	9.9E-07	9.4E-06			3.0E-04	2.8E-06	9.2E-03						
	Exposure Point Total								3.7E-05					3.6E-02						
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.2E+01	3.1E-10	3.7E-09			8.6E-06	8.6E-10	1.0E-04						
	Exposure Point Total								3.7E-09					1.0E-04						
Exposure Medium Total - Group 2 Magazine Area									**3.7E-05**					**3.6E-02**						
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	9.5E+00	5.9E-06	5.6E-05	NE	7.2E-06	6.8E-05	3.0E-04	1.6E-05	5.5E-02	NE		2.0E-05		6.7E-02
		Dermal	Arsenic	1.7E+01		2.1E+01	9.5E+00	2.0E-06	1.9E-05		2.5E-06	2.3E-05	3.0E-04	5.6E-06	1.9E-02			6.9E-06		2.3E-02
	Exposure Point Total								7.5E-05			9.2E-05			7.4E-02					9.0E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.2E+01	6.2E-10	7.5E-09		7.6E-10	9.2E-09	8.6E-06	1.7E-09	2.0E-04			2.1E-09		2.5E-04
	Exposure Point Total								7.5E-09			9.2E-09			2.0E-04					2.5E-04
Exposure Medium Total - Group 3 Magazine Area									**7.5E-05**			**9.2E-05**			**7.4E-02**					**9.0E-02**
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	9.5E+00	4.2E-06	3.9E-05	NE	3.9E-06	3.7E-05	3.0E-04	1.2E-05	3.9E-02	NE		1.1E-05		3.6E-02
		Dermal	Arsenic	1.2E+01		1.1E+01	9.5E+00	1.4E-06	1.3E-05		1.3E-06	1.3E-05	3.0E-04	4.0E-06	1.3E-02			3.7E-06		1.2E-02
	Exposure Point Total								5.3E-05			5.0E-05			5.2E-02					4.9E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.2E+01	4.4E-10	5.3E-09		4.1E-10	5.0E-09	8.6E-06	1.2E-09	1.4E-04			1.2E-09		1.3E-04
	Exposure Point Total								5.3E-09			5.0E-09			1.4E-04					1.3E-04
Exposure Medium Total - Group 4 Magazine Area									**5.3E-05**			**5.0E-05**			**5.2E-02**					**4.9E-02**
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	9.5E+00	7.7E-06	7.3E-05	NE	5.9E-06	5.6E-05	3.0E-04	2.2E-05	7.2E-02	NE		1.7E-05		5.5E-02
		Dermal	Arsenic	2.2E+01		1.7E+01	9.5E+00	2.6E-06	2.5E-05		2.0E-06	1.9E-05	3.0E-04	7.4E-06	2.5E-02			5.7E-06		1.9E-02
	Exposure Point Total								9.9E-05			7.5E-05			9.7E-02					7.4E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.2E+01	8.2E-10	9.8E-09		6.3E-10	7.5E-09	8.6E-06	2.3E-09	2.7E-04			1.8E-09		2.0E-04
	Exposure Point Total								9.8E-09			7.5E-09			2.7E-04					2.0E-04
Exposure Medium Total - Group 5 Magazine Area									**9.9E-05**			**7.5E-05**			**9.7E-02**					**7.4E-02**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.2.2

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE INDUSTRIAL/COMMERCIAL WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Industrial/Commercial Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																									
Group 2	Site Soil	Arsenic	2.7E-05	--	9.4E-06	3.7E-05	NE				NE				Skin	2.7E-02	--	9.2E-03	3.6E-02	NE				NE			
	Exposure Point Total					3.7E-05													3.6E-02								
	Outdoor Air	Arsenic	--	3.7E-09	--	3.7E-09									Developmental, Cardiovascular, CNS	--	1.0E-04	--	1.0E-04								
	Exposure Point Total					3.7E-09													1.0E-04								
Exposure Medium Total - Group 2 Magazine Area						**3.7E-05**													**3.6E-02**								
Group 3	Site Soil	Arsenic	5.6E-05	--	1.9E-05	7.5E-05	NE				6.8E-05	--	2.3E-05	9.2E-05	Skin	5.5E-02	--	1.9E-02	7.4E-02	NE				6.7E-02	--	2.3E-02	9.0E-02
	Exposure Point Total					7.5E-05								9.2E-05					7.4E-02								9.0E-02
	Outdoor Air	Arsenic	--	7.5E-09	--	7.5E-09					--	9.2E-09	--	9.2E-09	Developmental, Cardiovascular, CNS	--	2.0E-04	--	2.0E-04					--	2.5E-04	--	2.5E-04
	Exposure Point Total					7.5E-09								9.2E-09					2.0E-04								2.5E-04
Exposure Medium Total - Group 3 Magazine Area						**7.5E-05**								**9.2E-05**					**7.4E-02**								**9.0E-02**
Group 4	Site Soil	Arsenic	3.9E-05	--	1.3E-05	5.3E-05	NE				3.7E-05	--	1.3E-05	5.0E-05	Skin	3.9E-02	--	1.3E-02	5.2E-02	NE				3.6E-02	--	1.2E-02	4.9E-02
	Exposure Point Total					5.3E-05								5.0E-05					5.2E-02								4.9E-02
	Outdoor Air	Arsenic	--	5.3E-09	--	5.3E-09					--	5.0E-09	--	5.0E-09	Developmental, Cardiovascular, CNS	--	1.4E-04	--	1.4E-04					--	1.3E-04	--	1.3E-04
	Exposure Point Total					5.3E-09								5.0E-09					1.4E-04								1.3E-04
Exposure Medium Total - Group 4 Magazine Area						**5.3E-05**								**5.0E-05**					**5.2E-02**								**4.9E-02**
Group 5	Site Soil	Arsenic	7.3E-05	--	2.5E-05	9.9E-05	NE				5.6E-05	--	1.9E-05	7.5E-05	Skin	7.2E-02	--	2.5E-02	9.7E-02	NE				5.5E-02	--	1.9E-02	7.4E-02
	Exposure Point Total					9.9E-05								7.5E-05					9.7E-02								7.4E-02
	Outdoor Air	Arsenic	--	9.8E-09	--	9.8E-09					--	7.5E-09	--	7.5E-09	Developmental, Cardiovascular, CNS	--	2.7E-04	--	2.7E-04					--	2.0E-04	--	2.0E-04
	Exposure Point Total					9.8E-09								7.5E-09					2.7E-04								2.0E-04
Exposure Medium Total - Group 5 Magazine Area						**9.9E-05**								**7.5E-05**					**9.7E-02**								**7.4E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
NE	Not evaluated - concentration not above background concentration
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	1.0E-04	--	--	2.0E-04	--	2.5E-04	1.4E-04	--	1.3E-04	2.7E-04	--	2.0E-04
CNS	--	--	--	1.0E-04	--	--	2.0E-04	--	2.5E-04	1.4E-04	--	1.3E-04	2.7E-04	--	2.0E-04
Developmental	--	--	--	1.0E-04	--	--	2.0E-04	--	2.5E-04	1.4E-04	--	1.3E-04	2.7E-04	--	2.0E-04
Skin	--	--	--	3.6E-02	--	--	7.4E-02	--	9.0E-02	5.2E-02	--	4.9E-02	9.7E-02	--	7.4E-02

TABLE G3-7.2.3

EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg)			Cancer Risk							Noncancer Hazard Quotient						
				Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	CSF $(mg/kg\text{-}day)^{-1}$	Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Surface Soil (0-0.5) Cancer Risk	Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Subsurface Soil (0.5-10) Cancer Risk	Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Surface and Subsurface Soil (0-10) Cancer Risk	RfD (mg/kg-day)	Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Surface Soil (0-0.5) Hazard Quotient	Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Subsurface Soil (0.5-10) Hazard Quotient	Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	9.5E+00	1.4E-07	1.3E-06	NE	NE	NE	NE	3.0E-04	9.6E-06	3.2E-02	NE	NE	NE	NE
		Dermal	Arsenic	8.3E+00			9.5E+00	5.7E-08	5.4E-07					3.0E-04	4.0E-06	1.3E-02				
	Exposure Point Total								1.8E-06							4.5E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.2E+01	8.3E-09	1.0E-07					8.6E-06	5.8E-07	6.8E-02				
	Exposure Point Total								1.0E-07							6.8E-02				
Exposure Medium Total - Group 2 Magazine Area									**1.9E-06**							**1.1E-01**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	9.5E+00	2.8E-07	2.7E-06	NE	3.4E-07	3.2E-06	3.0E-04	2.0E-05	6.5E-02	NE	2.4E-05	8.0E-02		
		Dermal	Arsenic	1.7E+01		2.1E+01	9.5E+00	1.2E-07	1.1E-06		1.4E-07	1.3E-06	3.0E-04	8.1E-06	2.7E-02		9.9E-06	3.3E-02		
	Exposure Point Total								3.8E-06			4.6E-06			9.2E-02			1.1E-01		
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.2E+01	1.7E-08	2.0E-07		2.1E-08	2.5E-07	8.6E-06	1.2E-06	1.4E-01		1.5E-06	1.7E-01		
	Exposure Point Total								2.0E-07			2.5E-07			1.4E-01			1.7E-01		
Exposure Medium Total - Group 3 Magazine Area									**4.0E-06**			**4.8E-06**			**2.3E-01**			**2.8E-01**		
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	9.5E+00	2.0E-07	1.9E-06	NE	1.9E-07	1.8E-06	3.0E-04	1.4E-05	4.6E-02	NE	1.3E-05	4.3E-02		
		Dermal	Arsenic	1.2E+01		1.1E+01	9.5E+00	8.2E-08	7.8E-07		7.7E-08	7.3E-07	3.0E-04	5.7E-06	1.9E-02		5.4E-06	1.8E-02		
	Exposure Point Total								2.7E-06			2.5E-06			6.5E-02			6.1E-02		
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.2E+01	1.2E-08	1.4E-07		1.1E-08	1.3E-07	8.6E-06	8.4E-07	9.7E-02		7.9E-07	9.1E-02		
	Exposure Point Total								1.4E-07			1.3E-07			9.7E-02			9.1E-02		
Exposure Medium Total - Group 4 Magazine Area									**2.8E-06**			**2.6E-06**			**1.6E-01**			**1.5E-01**		
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	9.5E+00	3.7E-07	3.5E-06	NE	2.8E-07	2.7E-06	3.0E-04	2.6E-05	8.6E-02	NE	2.0E-05	6.6E-02		
		Dermal	Arsenic	2.2E+01		1.7E+01	9.5E+00	1.5E-07	1.4E-06		1.2E-07	1.1E-06	3.0E-04	1.1E-05	3.6E-02		8.1E-06	2.7E-02		
	Exposure Point Total								4.9E-06			3.8E-06			1.2E-01			9.3E-02		
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.2E+01	2.2E-08	2.7E-07		1.7E-08	2.0E-07	8.6E-06	1.6E-06	1.8E-01		1.2E-06	1.4E-01		
	Exposure Point Total								2.7E-07			2.0E-07			1.8E-01			1.4E-01		
Exposure Medium Total - Group 5 Magazine Area									**5.2E-06**			**4.0E-06**			**3.0E-01**			**2.3E-01**		

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.2.3

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CONSTRUCTION WORKER

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																										
Group 2	Site Soil	Arsenic	1.3E-06	--	5.4E-07	1.8E-06	NE				NE				Skin	3.2E-02	--	1.3E-02	4.5E-02	NE				NE			
	Exposure Point Total					1.8E-06													4.5E-02								
	Outdoor Air	Arsenic	--	1.0E-07	--	1.0E-07									Developmental, Cardiovascular, CNS	--	6.8E-02	--	6.8E-02								
	Exposure Point Total					1.0E-07													6.8E-02								
Exposure Medium Total - Group 2 Magazine Area						**1.9E-06**													**1.1E-01**								
Group 3	Site Soil	Arsenic	2.7E-06	--	1.1E-06	3.8E-06	NE				3.2E-06	--	1.3E-06	4.6E-06	Skin	6.5E-02	--	2.7E-02	9.2E-02	NE				8.0E-02	--	3.3E-02	1.1E-01
	Exposure Point Total					3.8E-06								4.6E-06					9.2E-02								1.1E-01
	Outdoor Air	Arsenic	--	2.0E-07	--	2.0E-07					--	2.5E-07	--	2.5E-07	Developmental, Cardiovascular, CNS	--	1.4E-01	--	1.4E-01					--	1.7E-01	--	1.7E-01
	Exposure Point Total					2.0E-07								2.5E-07					1.4E-01								1.7E-01
Exposure Medium Total - Group 3 Magazine Area						**4.0E-06**								**4.8E-06**					**2.3E-01**								**2.8E-01**
Group 4	Site Soil	Arsenic	1.9E-06	--	7.8E-07	2.7E-06	NE				1.8E-06	--	7.3E-07	2.5E-06	Skin	4.6E-02	--	1.9E-02	6.5E-02	NE				4.3E-02	--	1.8E-02	6.1E-02
	Exposure Point Total					2.7E-06								2.5E-06					6.5E-02								6.1E-02
	Outdoor Air	Arsenic	--	1.4E-07	--	1.4E-07					--	1.3E-07	--	1.3E-07	Developmental, Cardiovascular, CNS	--	9.7E-02	--	9.7E-02					--	9.1E-02	--	9.1E-02
	Exposure Point Total					1.4E-07								1.3E-07					9.7E-02								9.1E-02
Exposure Medium Total - Group 4 Magazine Area						**2.8E-06**								**2.6E-06**					**1.6E-01**								**1.5E-01**
Group 5	Site Soil	Arsenic	3.5E-06	--	1.4E-06	4.9E-06	NE				2.7E-06	--	1.1E-06	3.8E-06	Skin	8.6E-02	--	3.6E-02	1.2E-01	NE				6.6E-02	--	2.7E-02	9.3E-02
	Exposure Point Total					4.9E-06								3.8E-06					1.2E-01								9.3E-02
	Outdoor Air	Arsenic	--	2.7E-07	--	2.7E-07					--	2.0E-07	--	2.0E-07	Developmental, Cardiovascular, CNS	--	1.8E-01	--	1.8E-01					--	1.4E-01	--	1.4E-01
	Exposure Point Total					2.7E-07								2.0E-07					1.8E-01								1.4E-01
Exposure Medium Total - Group 5 Magazine Area						**5.2E-06**								**4.0E-06**					**3.0E-01**								**2.3E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	6.8E-02	--	--	1.4E-01	--	1.7E-01	9.7E-02	--	9.1E-02	1.8E-01	--	1.4E-01
CNS	--	--	--	6.8E-02	--	--	1.4E-01	--	1.7E-01	9.7E-02	--	9.1E-02	1.8E-01	--	1.4E-01
Developmental	--	--	--	6.8E-02	--	--	1.4E-01	--	1.7E-01	9.7E-02	--	9.1E-02	1.8E-01	--	1.4E-01
Skin	--	--	--	4.5E-02	--	--	9.2E-02	--	1.1E-01	6.5E-02	--	6.1E-02	1.2E-01	--	9.3E-02

TABLE G3-7.2.4
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0 10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0 10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	9.5E+00	3.9E-06	3.7E-05	NE		NE		3.0E-04	1.1E-05	3.8E-02	NE		NE	
		Dermal	Arsenic	8.3E+00			9.5E+00	4.6E-07	4.4E-06					3.0E-04	1.4E-06	4.5E-03				
	Exposure Point Total								4.1E-05							4.2E-02				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.2E+01	5.9E-10	7.0E-09					8.6E-06	1.7E-09	2.0E-04				
	Exposure Point Total								7.0E-09							2.0E-04				
Exposure Medium Total - Group 2 Magazine Area									**4.1E-05**							**4.2E-02**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	9.5E+00	7.9E-06	7.5E-05	NE		9.7E-06	9.2E-05	3.0E-04	2.3E-05	7.7E-02	NE		2.8E-05	9.4E-02
		Dermal	Arsenic	1.7E+01		2.1E+01	9.5E+00	9.5E-07	9.0E-06			1.2E-06	1.1E-05	3.0E-04	2.8E-06	9.2E-03			3.4E-06	1.1E-02
	Exposure Point Total								8.4E-05				1.0E-04			8.6E-02				1.1E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.2E+01	1.2E-09	1.4E-08			1.5E-09	1.8E-08	8.6E-06	3.5E-09	4.1E-04			4.3E-09	5.0E-04
	Exposure Point Total								1.4E-08				1.8E-08			4.1E-04				5.0E-04
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	9.5E+00	5.6E-06	5.3E-05	NE		5.2E-06	5.0E-05	3.0E-04	1.6E-05	5.4E-02	NE		1.5E-05	5.1E-02
		Dermal	Arsenic	1.2E+01		1.1E+01	9.5E+00	6.7E-07	6.3E-06			6.3E-07	6.0E-06	3.0E-04	1.9E-06	6.5E-03			1.8E-06	6.1E-03
	Exposure Point Total								5.9E-05				5.6E-05			6.1E-02				5.7E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.2E+01	8.5E-10	1.0E-08			7.9E-10	9.5E-09	8.6E-06	2.5E-09	2.9E-04			2.3E-09	2.7E-04
	Exposure Point Total								1.0E-08				9.5E-09			2.9E-04				2.7E-04
									5.9E-05				**5.6E-05**			**6.1E-02**				**5.7E-02**
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	9.5E+00	1.0E-05	9.9E-05	NE		7.9E-06	7.5E-05	3.0E-04	3.0E-05	1.0E-01	NE		2.3E-05	7.7E-02
		Dermal	Arsenic	2.2E+01		1.7E+01	9.5E+00	1.2E-06	1.2E-05			9.5E-07	9.0E-06	3.0E-04	3.6E-06	1.2E-02			2.8E-06	9.2E-03
	Exposure Point Total								1.1E-04				8.4E-05			1.1E-01				8.6E-02
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.2E+01	1.6E-09	1.9E-08			1.2E-09	1.4E-08	8.6E-06	4.6E-09	5.3E-04			3.5E-09	4.1E-04
	Exposure Point Total								1.9E-08				1.4E-08			5.3E-04				4.1E-04
									1.1E-04				**8.4E-05**			**1.1E-01**				**8.7E-02**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.2.4

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																									
Group 2	Site Soil	Arsenic	3.7E-05	--	4.4E-06	4.1E-05	NE				NE				Skin	3.8E-02	--	4.5E-03	4.2E-02	NE				NE			
	Exposure Point Total					4.1E-05													4.2E-02								
	Outdoor Air	Arsenic	--	7.0E-09	--	7.0E-09									Developmental, Cardiovascular, CNS	--	2.0E-04	--	2.0E-04								
	Exposure Point Total					7.0E-09													2.0E-04								
Exposure Medium Total - Group 2 Magazine Area						**4.1E-05**													**4.2E-02**								
Group 3	Site Soil	Arsenic	7.5E-05	--	9.0E-06	8.4E-05	NE				9.2E-05	--	1.1E-05	1.0E-04	Skin	7.7E-02	--	9.2E-03	8.6E-02	NE				9.4E-02	--	1.1E-02	1.1E-01
	Exposure Point Total					8.4E-05								1.0E-04					8.6E-02								1.1E-01
	Outdoor Air	Arsenic	--	1.4E-08	--	1.4E-08					--	1.8E-08	--	1.8E-08	Developmental, Cardiovascular, CNS	--	4.1E-04	--	4.1E-04					--	5.0E-04	--	5.0E-04
	Exposure Point Total					1.4E-08								1.8E-08					4.1E-04								5.0E-04
Exposure Medium Total - Group 3 Magazine Area						**8.4E-05**								**1.0E-04**					**8.6E-02**								**1.1E-01**
Group 4	Site Soil	Arsenic	5.3E-05	--	6.3E-06	5.9E-05	NE				5.0E-05	--	6.0E-06	5.6E-05	Skin	5.4E-02	--	6.5E-03	6.1E-02	NE				5.1E-02	--	6.1E-03	5.7E-02
	Exposure Point Total					5.9E-05								5.6E-05					6.1E-02								5.7E-02
	Outdoor Air	Arsenic	--	1.0E-08	--	1.0E-08					--	9.5E-09	--	9.5E-09	Developmental, Cardiovascular, CNS	--	2.9E-04	--	2.9E-04					--	2.7E-04	--	2.7E-04
	Exposure Point Total					1.0E-08								9.5E-09					2.9E-04								2.7E-04
Exposure Medium Total - Group 4 Magazine Area						**5.9E-05**								**5.6E-05**					**6.1E-02**								**5.7E-02**
Group 5	Site Soil	Arsenic	9.9E-05	--	1.2E-05	1.1E-04	NE				7.5E-05	--	9.0E-06	8.4E-05	Skin	1.0E-01	--	1.2E-02	1.1E-01	NE				7.7E-02	--	9.2E-03	8.6E-02
	Exposure Point Total					1.1E-04								8.4E-05					1.1E-01								8.6E-02
	Outdoor Air	Arsenic	--	1.9E-08	--	1.9E-08					--	1.4E-08	--	1.4E-08	Developmental, Cardiovascular, CNS	--	5.3E-04	--	5.3E-04					--	4.1E-04	--	4.1E-04
	Exposure Point Total					1.9E-08								1.4E-08					5.3E-04								4.1E-04
Exposure Medium Total - Group 5 Magazine Area						**1.1E-04**								**8.4E-05**					**1.1E-01**								**8.7E-02**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	2.0E-04	--	--	4.1E-04	--	5.0E-04	2.9E-04	--	2.7E-04	5.3E-04	--	4.1E-04
CNS	--	--	--	2.0E-04	--	--	4.1E-04	--	5.0E-04	2.9E-04	--	2.7E-04	5.3E-04	--	4.1E-04
Developmental	--	--	--	2.0E-04	--	--	4.1E-04	--	5.0E-04	2.9E-04	--	2.7E-04	5.3E-04	--	4.1E-04
Skin	--	--	--	4.2E-02	--	--	8.6E-02	--	1.1E-01	6.1E-02	--	5.7E-02	1.1E-01	--	8.6E-02

TABLE G3-7.2.5
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0 10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0 10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	9.5E+00	9.0E-06	8.6E-05	NE	NE			3.0E-04	1.1E-04	3.5E-01	NE		NE	
		Dermal	Arsenic	8.3E+00			9.5E+00	7.9E-07	7.5E-06					3.0E-04	9.2E-06	3.1E-02				
	Exposure Point Total								9.3E-05							3.8E-01				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.2E+01	3.4E-10	4.1E-09					8.6E-06	4.0E-09	4.6E-04				
	Exposure Point Total								4.1E-09							4.6E-04				
Exposure Medium Total - Group 2 Magazine Area									**9.3E-05**							**3.8E-01**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	9.5E+00	1.8E-05	1.8E-04	NE	2.3E-05	2.1E-04		3.0E-04	2.1E-04	7.2E-01	NE		2.6E-04	8.8E-01
		Dermal	Arsenic	1.7E+01		2.1E+01	9.5E+00	1.6E-06	1.5E-05		2.0E-06	1.9E-05		3.0E-04	1.9E-05	6.2E-02			2.3E-05	7.6E-02
	Exposure Point Total								1.9E-04			2.3E-04				7.8E-01				9.5E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.2E+01	7.0E-10	8.4E-09		8.6E-10	1.0E-08		8.6E-06	8.1E-09	9.5E-04			1.0E-08	1.2E-03
	Exposure Point Total								8.4E-09			1.0E-08				9.5E-04				1.2E-03
Exposure Medium Total - Group 3 Magazine Area									**1.9E-04**			**2.3E-04**				**7.8E-01**				**9.6E-01**
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	9.5E+00	1.3E-05	1.2E-04	NE	1.2E-05	1.2E-04		3.0E-04	1.5E-04	5.1E-01	NE		1.4E-04	4.8E-01
		Dermal	Arsenic	1.2E+01		1.1E+01	9.5E+00	1.1E-06	1.1E-05		1.1E-06	1.0E-05		3.0E-04	1.3E-05	4.4E-02			1.2E-05	4.1E-02
	Exposure Point Total								1.3E-04			1.3E-04				5.5E-01				5.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.2E+01	4.9E-10	5.9E-09		4.6E-10	5.6E-09		8.6E-06	5.8E-09	6.7E-04			5.4E-09	6.3E-04
	Exposure Point Total								5.9E-09			5.6E-09				6.7E-04				6.3E-04
Exposure Medium Total - Group 4 Magazine Area									**1.3E-04**			**1.3E-04**				**5.5E-01**				**5.2E-01**
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	9.5E+00	2.4E-05	2.3E-04	NE	1.9E-05	1.8E-04		3.0E-04	2.8E-04	9.4E-01	NE		2.2E-04	7.2E-01
		Dermal	Arsenic	2.2E+01		1.7E+01	9.5E+00	2.1E-06	2.0E-05		1.6E-06	1.5E-05		3.0E-04	2.5E-05	8.2E-02			1.9E-05	6.3E-02
	Exposure Point Total								2.5E-04			1.9E-04				1.0E+00				7.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.2E+01	9.2E-10	1.1E-08		7.0E-10	8.4E-09		8.6E-06	1.1E-08	1.2E-03			8.2E-09	9.5E-04
	Exposure Point Total								1.1E-08			8.4E-09				1.2E-03				9.5E-04
Exposure Medium Total - Group 5 Magazine Area									**2.5E-04**			**1.9E-04**				**1.0E+00**				**7.8E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.2.5

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Child Resident
Receptor Age:	Adult

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																										
Group 2	Site Soil	Arsenic	8.6E-05	--	7.5E-06	9.3E-05	NE				NE				Skin	3.5E-01	--	3.1E-02	3.8E-01	NE				NE			
	Exposure Point Total					9.3E-05													3.8E-01								
	Outdoor Air	Arsenic	--	4.1E-09	--	4.1E-09									Developmental, Cardiovascular, CNS	--	4.6E-04	--	4.6E-04								
	Exposure Point Total					4.1E-09													4.6E-04								
Exposure Medium Total - Group 2 Magazine Area						**9.3E-05**													**3.8E-01**								
Group 3	Site Soil	Arsenic	1.8E-04	--	1.5E-05	1.9E-04	NE				2.1E-04	--	1.9E-05	2.3E-04	Skin	7.2E-01	--	6.2E-02	7.8E-01	NE				8.8E-01	--	7.6E-02	9.5E-01
	Exposure Point Total					1.9E-04								2.3E-04					7.8E-01								9.5E-01
	Outdoor Air	Arsenic	--	8.4E-09	--	8.4E-09					--	1.0E-08	--	1.0E-08	Developmental, Cardiovascular, CNS	--	9.5E-04	--	9.5E-04					--	1.2E-03	--	1.2E-03
	Exposure Point Total					8.4E-09								1.0E-08					9.5E-04								1.2E-03
Exposure Medium Total - Group 3 Magazine Area						**1.9E-04**								**2.3E-04**					**7.8E-01**								**9.6E-01**
Group 4	Site Soil	Arsenic	1.2E-04	--	1.1E-05	1.3E-04	NE				1.2E-04	--	1.0E-05	1.3E-04	Skin	5.1E-01	--	4.4E-02	5.5E-01	NE				4.8E-01	--	4.1E-02	5.2E-01
	Exposure Point Total					1.3E-04								1.3E-04					5.5E-01								5.2E-01
	Outdoor Air	Arsenic	--	5.9E-09	--	5.9E-09					--	5.6E-09	--	5.6E-09	Developmental, Cardiovascular, CNS	--	6.7E-04	--	6.7E-04					--	6.3E-04	--	6.3E-04
	Exposure Point Total					5.9E-09								5.6E-09					6.7E-04								6.3E-04
Exposure Medium Total - Group 4 Magazine Area						**1.3E-04**								**1.3E-04**					**5.5E-01**								**5.2E-01**
Group 5	Site Soil	Arsenic	2.3E-04	--	2.0E-05	2.5E-04	NE				1.8E-04	--	1.5E-05	1.9E-04	Skin	9.4E-01	--	8.2E-02	1.0E+00	NE				7.2E-01	--	6.3E-02	7.8E-01
	Exposure Point Total					2.5E-04								1.9E-04					1.0E+00								7.8E-01
	Outdoor Air	Arsenic	--	1.1E-08	--	1.1E-08					--	8.4E-09	--	8.4E-09	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03					--	9.5E-04	--	9.5E-04
	Exposure Point Total					1.1E-08								8.4E-09					1.2E-03								9.5E-04
Exposure Medium Total - Group 5 Magazine Area						**2.5E-04**								**1.9E-04**					**1.0E+00**								**7.8E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
CNS	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Developmental	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Skin	--	--	--	3.8E-01	--	--	7.8E-01	--	9.5E-01	5.5E-01	--	5.2E-01	**1.0E+00**	--	7.8E-01

TABLE G3-7.2.6
EPA RAGS PART D TABLE 7, CALCULATION OF RME CHEMICAL CANCER RISKS AND NONCANCER HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT
Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	Exposure Route	COPC	EPC (mg/kg) Surface Soil (0-0.5)	EPC (mg/kg) Subsurface Soil (0.5-10)	EPC (mg/kg) Surface and Subsurface Soil (0-10)	Cancer Risk CSF (mg/kg-day)$^{-1}$	Cancer Risk Surface Soil (0-0.5) Intake/Exposure Concentration (mg/kg-day)	Cancer Risk Surface Soil (0-0.5) Cancer Risk	Cancer Risk Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Subsurface Soil (0.5-10) Cancer Risk	Cancer Risk Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Cancer Risk Surface and Subsurface Soil (0-10) Cancer Risk	Noncancer Hazard Quotient RfD (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface Soil (0-0.5) Hazard Quotient	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Subsurface Soil (0.5-10) Hazard Quotient	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Intake/ Exposure Concentration (mg/kg-day)	Noncancer Hazard Quotient Surface and Subsurface Soil (0-10) Hazard Quotient
Group 1	NE																			
Group 2	Site Soil	Ingestion	Arsenic	8.3E+00	NE	NE	9.5E+00	1.3E-05	1.2E-04	NE	NE			3.0E-04	1.1E-04	3.5E-01	NE		NE	
		Dermal	Arsenic	8.3E+00			9.5E+00	1.3E-06	1.2E-05					3.0E-04	9.2E-06	3.1E-02				
	Exposure Point Total								1.3E-04							3.8E-01				
	Outdoor Air	Inhalation (Partculates)	Arsenic	8.3E+00			1.2E+01	9.3E-10	1.1E-08					8.6E-06	4.0E-09	4.6E-04				
	Exposure Point Total								1.1E-08							4.6E-04				
Exposure Medium Total - Group 2 Magazine Area									**1.3E-04**							**3.8E-01**				
Group 3	Site Soil	Ingestion	Arsenic	1.7E+01	NE	2.1E+01	9.5E+00	2.6E-05	2.5E-04	NE	3.2E-05	3.1E-04		3.0E-04	2.1E-04	7.2E-01	NE		2.6E-04	8.8E-01
		Dermal	Arsenic	1.7E+01		2.1E+01	9.5E+00	2.5E-06	2.4E-05		3.1E-06	3.0E-05		3.0E-04	1.9E-05	6.2E-02			2.3E-05	7.6E-02
	Exposure Point Total								2.7E-04			3.4E-04				7.8E-01				9.5E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.7E+01		2.1E+01	1.2E+01	1.9E-09	2.3E-08		2.3E-09	2.8E-08		8.6E-06	8.1E-09	9.5E-04			1.0E-08	1.2E-03
	Exposure Point Total								2.3E-08			2.8E-08				9.5E-04				1.2E-03
Exposure Medium Total - Group 3 Magazine Area									**2.7E-04**			**3.4E-04**				**7.8E-01**				**9.6E-01**
Group 4	Site Soil	Ingestion	Arsenic	1.2E+01	NE	1.1E+01	9.5E+00	1.9E-05	1.8E-04	NE	1.7E-05	1.7E-04		3.0E-04	1.5E-04	5.1E-01	NE		1.4E-04	4.8E-01
		Dermal	Arsenic	1.2E+01		1.1E+01	9.5E+00	1.8E-06	1.7E-05		1.7E-06	1.6E-05		3.0E-04	1.3E-05	4.4E-02			1.2E-05	4.1E-02
	Exposure Point Total								1.9E-04			1.8E-04				5.5E-01				5.2E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	1.2E+01		1.1E+01	1.2E+01	1.3E-09	1.6E-08		1.3E-09	1.5E-08		8.6E-06	5.8E-09	6.7E-04			5.4E-09	6.3E-04
	Exposure Point Total								1.6E-08			1.5E-08				6.7E-04				6.3E-04
Exposure Medium Total - Group 4 Magazine Area									**1.9E-04**			**1.8E-04**				**5.5E-01**				**5.2E-01**
Group 5	Site Soil	Ingestion	Arsenic	2.2E+01	NE	1.7E+01	9.5E+00	3.5E-05	3.3E-04	NE	2.6E-05	2.5E-04		3.0E-04	2.8E-04	9.4E-01	NE		2.2E-04	7.2E-01
		Dermal	Arsenic	2.2E+01		1.7E+01	9.5E+00	3.4E-06	3.2E-05		2.6E-06	2.4E-05		3.0E-04	2.5E-05	8.2E-02			1.9E-05	6.3E-02
	Exposure Point Total								3.6E-04			2.8E-04				1.0E+00				7.8E-01
	Outdoor Air	Inhalation (Partculates)	Arsenic	2.2E+01		1.7E+01	1.2E+01	2.5E-09	3.0E-08		1.9E-09	2.3E-08		8.6E-06	1.1E-08	1.2E-03			8.2E-09	9.5E-04
	Exposure Point Total								3.0E-08			2.3E-08				1.2E-03				9.5E-04
Exposure Medium Total - Group 5 Magazine Area									**3.6E-04**			**2.8E-04**				**1.0E+00**				**7.8E-01**

Notes:

--	Not available or not applicable	EPC	Exposure point concentration	NE	Not evaluated - concentration not above background concentration
COPC	Chemical of potential concern	mg/kg	Milligram per kilogram	RAGS	Risk Assessment Guidance for Superfund
CSF	Cancer slope factor	mg/kg-day	Milligram per kilogram per day	RfD	Reference dose
EPA	U.S. Environmental Protection Agency	(mg/kg-day)-1	1/(Milligram per kilogram per day)	RME	Reasonable maximum exposure

TABLE G3-8.2.6

EPA RAGS PART D TABLE 9, SUMMARY OF RECEPTOR RISKS AND HAZARDS, INCREMENTAL RISK EVALUATION, STATE OF CALIFORNIA TOXICITY CRITERIA, SITE 22A – FUTURE ADULT AND CHILD RESIDENT

Remedial Investigation Report for Site 22A, Inland Area, Former Naval Weapons Station Concord, Concord, California

Scenario Timeframe:	Future
Receptor Population:	Adult and Child Resident
Receptor Age:	Adult and Child

Exposure Medium (Magazine Area)	Exposure Point	COPC	Cancer Risk												Noncancer Hazard Quotient											
			Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)					Surface Soil (0-0.5)				Subsurface Soil (0.5-10)				Surface and Subsurface Soil (0-10)			
			Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Group 1	NE																									
Group 2	Site Soil	Arsenic	1.2E-04	--	1.2E-05	1.3E-04	NE				NE				Skin	3.5E-01	--	3.1E-02	3.8E-01	NE				NE			
	Exposure Point Total					1.3E-04													3.8E-01								
	Outdoor Air	Arsenic	--	1.1E-08	--	1.1E-08									Developmental, Cardiovascular, CNS	--	4.6E-04	--	4.6E-04								
	Exposure Point Total					1.1E-08													4.6E-04								
Exposure Medium Total - Group 2 Magazine Area						**1.3E-04**													**3.8E-01**								
Group 3	Site Soil	Arsenic	2.5E-04	--	2.4E-05	2.7E-04	NE				3.1E-04	--	3.0E-05	3.4E-04	Skin	7.2E-01	--	6.2E-02	7.8E-01	NE				8.8E-01	--	7.6E-02	9.5E-01
	Exposure Point Total					2.7E-04								3.4E-04					7.8E-01								9.5E-01
	Outdoor Air	Arsenic	--	2.3E-08	--	2.3E-08					--	2.8E-08	--	2.8E-08	Developmental, Cardiovascular, CNS	--	9.5E-04	--	9.5E-04					--	1.2E-03	--	1.2E-03
	Exposure Point Total					2.3E-08								2.8E-08					9.5E-04								1.2E-03
Exposure Medium Total - Group 3 Magazine Area						**2.7E-04**								**3.4E-04**					**7.8E-01**								**9.6E-01**
Group 4	Site Soil	Arsenic	1.8E-04	--	1.7E-05	1.9E-04	NE				1.7E-04	--	1.6E-05	1.8E-04	Skin	5.1E-01	--	4.4E-02	5.5E-01	NE				4.8E-01	--	4.1E-02	5.2E-01
	Exposure Point Total					1.9E-04								1.8E-04					5.5E-01								5.2E-01
	Outdoor Air	Arsenic	--	1.6E-08	--	1.6E-08					--	1.5E-08	--	1.5E-08	Developmental, Cardiovascular, CNS	--	6.7E-04	--	6.7E-04					--	6.3E-04	--	6.3E-04
	Exposure Point Total					1.6E-08								1.5E-08					6.7E-04								6.3E-04
Exposure Medium Total - Group 4 Magazine Area						**1.9E-04**								**1.8E-04**					**5.5E-01**								**5.2E-01**
Group 5	Site Soil	Arsenic	3.3E-04	--	3.2E-05	3.6E-04	NE				2.5E-04	--	2.4E-05	2.8E-04	Skin	9.4E-01	--	8.2E-02	1.0E+00	NE				7.2E-01	--	6.3E-02	7.8E-01
	Exposure Point Total					3.6E-04								2.8E-04					1.0E+00								7.8E-01
	Outdoor Air	Arsenic	--	3.0E-08	--	3.0E-08					--	2.3E-08	--	2.3E-08	Developmental, Cardiovascular, CNS	--	1.2E-03	--	1.2E-03					--	9.5E-04	--	9.5E-04
	Exposure Point Total					3.0E-08								2.3E-08					1.2E-03								9.5E-04
Exposure Medium Total - Group 5 Magazine Area						**3.6E-04**								**2.8E-04**					**1.0E+00**								**7.8E-01**

Notes:

--	Not available or not applicable
CNS	Central nervous system
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
RAGS	Risk Assessment Guidance for Superfund
RME	Reasonable maximum exposure

Noncancer Target Organ Hazard Indices

	Magazine Area 1			Magazine Area 2			Magazine Area 3			Magazine Area 4			Magazine Area 5		
Target Organ	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)	Surface Soil (0-0.5)	Subsurface Soil (0.5-10)	Surface and Subsurface Soil (0-10)
Cardiovascular	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
CNS	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Developmental	--	--	--	4.6E-04	--	--	9.5E-04	--	1.2E-03	6.7E-04	--	6.3E-04	1.2E-03	--	9.5E-04
Skin	--	--	--	3.8E-01	--	--	7.8E-01	--	9.5E-01	5.5E-01	--	5.2E-01	**1.0E+00**	--	7.8E-01

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
19	ecological conceptual site model	Section 2.5.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix H: Sections H2.2 through H2.2.4 and Figure H-1. Tetra Tech. June 1, 2009.

Inorganic arsenate was a commonly applied pesticide during the pre-World War II era (University of Iowa College of Public Health 2003), and its primary use was as a pesticide on cotton fields and orchards (Agency for Toxic Substances and Disease Registry 2004). Review of aerial photographs from 1939 indicated that the land encompassing Site 22A, as well as the adjacent off-site properties, was used for agriculture, including walnut orchards.

Based on the 1947 newspaper article in the *Contra Costa Gazette* stating that sodium arsenite was used in the Magazine Area to kill tall grass, the Navy hypothesized that the source of arsenic at both Sites 22 and 22A was the result of the widespread application of arsenic-containing herbicides. This herbicide would have been applied either by the Navy or by previous owners who used the land for farming. Results of previous sampling in December 2005 at Site 22A (Groups 2 through 5 Magazine Areas [formerly known as Magazine Areas A through D]) indicated arsenic was present in surface soil at concentrations exceeding the arsenic background concentration (10 milligrams per kilogram [mg/kg]). These results further supported the Navy's hypothesis that concentrations above background were the result of widespread application of arsenic-containing herbicides to control the fire hazard from vegetation around the magazines during the late 1940s.

In July and August 2007 and January 2008, an additional 129 surface soil and 27 subsurface soil samples were collected at the Groups 1 through 5 Magazine Areas and analyzed for arsenic to test the hypothesis that arsenic-containing herbicides were applied. Results indicated that arsenic concentrations in soil within the open areas were below background and that arsenic concentrations in soil within areas near the magazines were above background. These findings were consistent with the working hypothesis that arsenic-containing herbicides were applied to control the fire hazard from vegetation around these structures.

H2.2 CONCEPTUAL SITE MODEL

The ecological conceptual site model illustrates exposure pathways to be evaluated in the SLERA and provides other key information such as chemical sources, release and transport mechanisms, and the relative importance of exposure pathways to specific receptor groups. The ecological conceptual site model includes the following components:

- Stressors
- Exposure pathways
- Fate and transport
- Assessment and measurement endpoints

The following sections briefly describe the components of the ecological conceptual site model for Site 22A, which is illustrated on Figure H-1.

H2.2.1 Stressors and Selection of COPECs

Stressors can be defined as any factor that causes adverse ecological impacts at the site. Only chemical stressors were evaluated for the SLERA, and specifically arsenic in soil. Arsenic data for soil (0.0 to 3.0 feet below ground surface [bgs] and 0.0 to 6.0 feet bgs) collected from Site 22A in December 2005, July and August 2007, and January 2008 were used to support the SLERA. Five data sets were used in this evaluation: one from each of the five groups of Magazine Areas. Both data sets included analysis for arsenic only. The arsenic concentrations from each area will be considered separately.

Summary statistics for arsenic were calculated and included detection frequency, arithmetic mean, minimum and maximum reported values, and 95 percent upper confidence limit on the arithmetic mean (95 UCL). Summary statistics are provided in Table H-1.

H2.2.2 Fate and Transport

Physical fate processes of concern include transport to groundwater, volatilization to air, transfer to surface water, and movement of contaminated soil particles through windblown dust or as suspended soil particles in surface water. Chemicals may also be transported in plant and animal tissues (biotic transport). For example, chemicals in the bodies of mobile receptors such as migrating birds, flying insects, and far-ranging predators may be carried off site and deposited in other locations in the form of feces or corpses.

Although exposure is a simple concept, accurately describing the fate and transport of chemicals from their source to a site of toxic action in living organisms can be complicated. In general, a chemical must leave the environmental matrix, move across several biological membranes, and concentrate in a tissue to the extent that its toxic action is exerted for exposure to occur. A chemical that can move from the environmental matrix to the tissue of a receptor is said to be bioavailable.

H2.2.3 Exposure Pathways and Exposure Routes

A chemical must be able to travel from the source to the representative receptor and must be taken up by the receptor through one or more exposure routes for an exposure pathway to be considered complete. Complete exposure pathways present the greatest potential risk of adverse effects for receptors of concern at a site. Potential exposure pathways that may result in receptor contact with chemicals include soils, surface water, groundwater, air, and food chain transfer.

Potential exposure pathways for arsenic at Site 22A are diagrammed in the ecological conceptual site model (see Figure H-1). Soil was considered the most important exposure medium. The surface water and groundwater exposure pathways were not evaluated because the site has no

permanent surface water bodies. However, there is a potential exposure pathway via ingestion of water during the wet season when water is present in the drainage ditches and other depressions. Groundwater is likely between 30 to 50 feet bgs, below a depth where it would be accessible to ecological receptors (Tetra Tech 2007a).

Windblown dust could represent a complete exposure pathway because some areas of exposed soil exist at Site 22A. However, exposure to windblown dust is an insignificant pathway when compared with food-chain transfer and direct exposure to soils (see the discussion below). Therefore, it was not considered further in this SLERA.

Exposure routes, or the point of entry of a chemical into a receptor, include root uptake and leaf sorption for plants and inhalation, dermal contact, and ingestion of contaminated soil, surface water, and food for animals (see Figure H-1). Plants exposed to chemicals in soil may accumulate concentrations in tissues that cause adverse effects on growth, reproduction, or survival. Independent of direct effects on the plant, chemicals in plant tissues may be transferred to herbivores, omnivores, and detritivores, which in turn may be consumed by omnivores and carnivores. Such food chain transfer and associated bioaccumulation may result in unacceptably high doses of chemicals to higher-trophic-level consumers. Therefore, risk to receptors at each trophic level was addressed separately to account for specificity in exposure parameters.

Ingestion of arsenic in soil and prey was considered the predominant exposure pathway for birds and mammals at Site 22A. Terrestrial birds and mammals may ingest soil directly while they feed, groom, and burrow (Beyer, Connor, and Gerould 1994). Soil on or in the bodies of prey may also be consumed with the prey. For example, a bird feeding on an earthworm may ingest soil incidentally while probing for and eating the worm. A food chain modeling approach was used to evaluate potential effects of ingestion of chemicals by representative birds and mammals. The dose assessment for higher-trophic-level receptors such as birds and mammals assumed that ingestion of contaminated prey and soil was the dominant exposure route and that the contributions of other exposure routes were negligible (Suter 1993). Bioaccumulation factors (BAF) were used to estimate the chemical burden in prey tissues for arsenic based on concentrations in surface soil at the site. BAFs describe bioaccumulation in terms of the ratio between the concentration of a substance in an organism due to chemical uptake and the concentration in the surrounding environment. BAFs used in this SLERA are presented in Attachment HC.

H2.2.4 Assessment and Measurement Endpoints

EPA defines assessment endpoints as "explicit expressions of the actual environmental values (e.g., ecological resources) that are to be protected" (EPA 1997). Assessment endpoints are environmental characteristics that, if impaired, would indicate a need for action by risk managers. Various definitions of valuable ecological resources include those without which ecosystem function would be impaired; those that provide critical resources, such as habitat or fisheries; and those perceived by humans as being valuable, such as endangered species and other issues addressed by legislation. Useful assessment endpoints define both the valuable ecological entities at the site and a characteristic of the entity to protect, such as reproductive success or production per unit area.

The focus during this assessment was on endpoints most likely to be affected given the fate and transport mechanisms of arsenic, the ecotoxicological properties of the arsenic, the habitats at the site, and the potential receptors at the site. The following assessment endpoints were used to evaluate the potential ecological risk at Site 22A:

- **Protection and maintenance of terrestrial plants.** Plants form the basis of the food web at the site, and adverse effects on plants could reduce the quantity and quality of food available to higher-trophic-level organisms. Therefore, the health of plants was considered an ecological value to be protected.

- **Protection and maintenance of soil invertebrates.** Invertebrates play an important role in nutrient cycling and in the food web at the site. Adverse effects on invertebrates could reduce the quantity and quality of food available to higher-trophic-level organisms. Therefore, the health of invertebrates was considered an ecological value to be protected.

- **Protection and maintenance of omnivorous birds typical to the area.** Secondary avian consumers provide a food source for upper-trophic-level consumers, such as avian and mammalian carnivores, and influence the abundance and diversity of invertebrates. Adverse effects on these secondary consumers could reduce the amount of food available to higher-trophic-level organisms. Therefore, maintenance of secondary avian consumers was considered an ecological value to be protected.

- **Protection and maintenance of carnivorous birds typical to the area.** Raptors are important tertiary consumers at the site and are susceptible to the effects of bioaccumulative chemicals. Adverse effects on raptors would be undesirable because the loss of predation could impair lower trophic levels. Therefore, maintenance of raptors was considered an ecological value to be protected.

- **Protection and maintenance of large and small herbivorous mammals typical to the area.** Herbivorous mammals influence the community structure of plants and provide food for upper-trophic-level organisms at the site. Adverse effects on these primary consumers could shift the composition of plant communities and reduce the amount of food available to higher-trophic-level organisms. Therefore, maintenance of large and small herbivorous mammals was considered an ecological value to be protected.

- **Protection and maintenance of omnivorous mammals typical to the area.** Omnivorous mammals provide a major source of food for upper-trophic-level organisms. Adverse effects on these secondary consumers could reduce the amount of food available to higher-trophic-level organisms. Therefore, maintenance of omnivorous mammals was considered an ecological value to be protected.

- **Protection and maintenance of carnivorous mammals typical to the area.** Carnivorous mammals are important tertiary consumers at the site and are susceptible to the effects of bioaccumulative chemicals. Negative effects on the carnivorous mammals would be undesirable because the loss of predation could impair lower trophic levels. Therefore, maintenance of carnivorous mammals was considered an ecological value to be protected.

Measurement endpoints related to assessment endpoints were identified because assessment endpoints are usually not amenable to direct measurement. EPA defines a measurement endpoint as "a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint and is a measure of biological effects (such as mortality, reproduction, or growth)" (EPA 1997). Measurement endpoints more closely reflect technical considerations in the risk assessment process; that is, measurement endpoints are focused on both direct measures of ecological effects such as toxicity tests and indirect measures such as food chain modeling that allow for an evaluation of risk to representative receptors. Measurement endpoints can include measures of exposure or effect and are frequently numerical expressions of observations. Measurement endpoints are often expressed as statistical or arithmetic summaries of observations and can include measures both of effect and of exposure. Each measurement endpoint correlates directly with one of the defined assessment endpoints and was based on available literature on mechanisms of toxicity.

Each measurement endpoint was selected based on the species or communities present or potentially present at Site 22A, the adequacy of the information on the specific endpoint based on literature research, and the ability of the endpoint to suggest information about the related assessment endpoint. Two of the species listed as measurement endpoints represent guilds of upper-trophic-level predators common in the terrestrial habitats of former NWS Concord. The top predators include raptors (represented by the red-tailed hawk) and carnivorous mammals (represented by the grey fox). Passerine birds (represented by the American robin) are omnivores and are potential prey for raptors, as are omnivorous small mammals (represented by the western harvest mouse), and small herbivorous burrowing mammals (represented by the California ground squirrel), and thus are included in the food chain analysis. The food chain analysis also modeled the effects of chemical exposure to the black-tailed deer because of its role as a large herbivorous mammal.

The following measurement endpoints were used in evaluating potential ecological effects on the assessment endpoints identified for Site 22A:

- **For terrestrial plants, comparison of the concentrations of chemicals in soil with toxicity benchmarks for plants.** Arsenic concentrations in soil were compared with the Ecological Soil Screening Level (Eco-SSL) (EPA 2005). Hazard quotients (HQ) were developed by dividing the maximum concentration in soil by the Eco-SSL benchmark. Potential risk to terrestrial plants was indicated where concentrations of arsenic in site soil exceeded the Eco-SSL benchmark.

- **For terrestrial invertebrates, comparison of concentrations of chemicals in soil with toxicity benchmarks for invertebrates.** Arsenic concentrations in soil were compared with Oak Ridge National Laboratory (ORNL) benchmarks for effects on invertebrates in soil and litter and on heterotrophic processes (Efroymson and others 1997a; ORNL 2006). HQs were developed by dividing the maximum concentration in soil by each ORNL benchmark. Potential risk to terrestrial invertebrates was indicated where concentrations of arsenic in site soil exceeded the ORNL benchmark.

- **For birds and mammals, reproductive or physiological effects were evaluated using the HQ approach.** Potential reproductive or physiological effects of arsenic were evaluated using literature-derived toxicity reference values (TRV). Conservative daily doses were modeled based on arsenic concentrations at the site and information on natural history for birds and mammals. HQs were developed by dividing the estimated daily dose for arsenic by the high and low TRVs.

Risk was evaluated qualitatively for terrestrial amphibians. The California red-legged frog (*Rana aurora draytonii*) and the California tiger salamander (*Ambystoma californiense*) are known to inhabit at former NWS Concord. Both species were observed in the Inland Area during ecological surveys conducted between 1998 and 1999 (Tetra Tech, Inc. 2002). However, little information on toxicity is available to assess risk to amphibians; therefore, risk to amphibians is evaluated qualitatively (see Section H5.0).

H3.0 ASSESSMENT OF RISK TO PLANTS

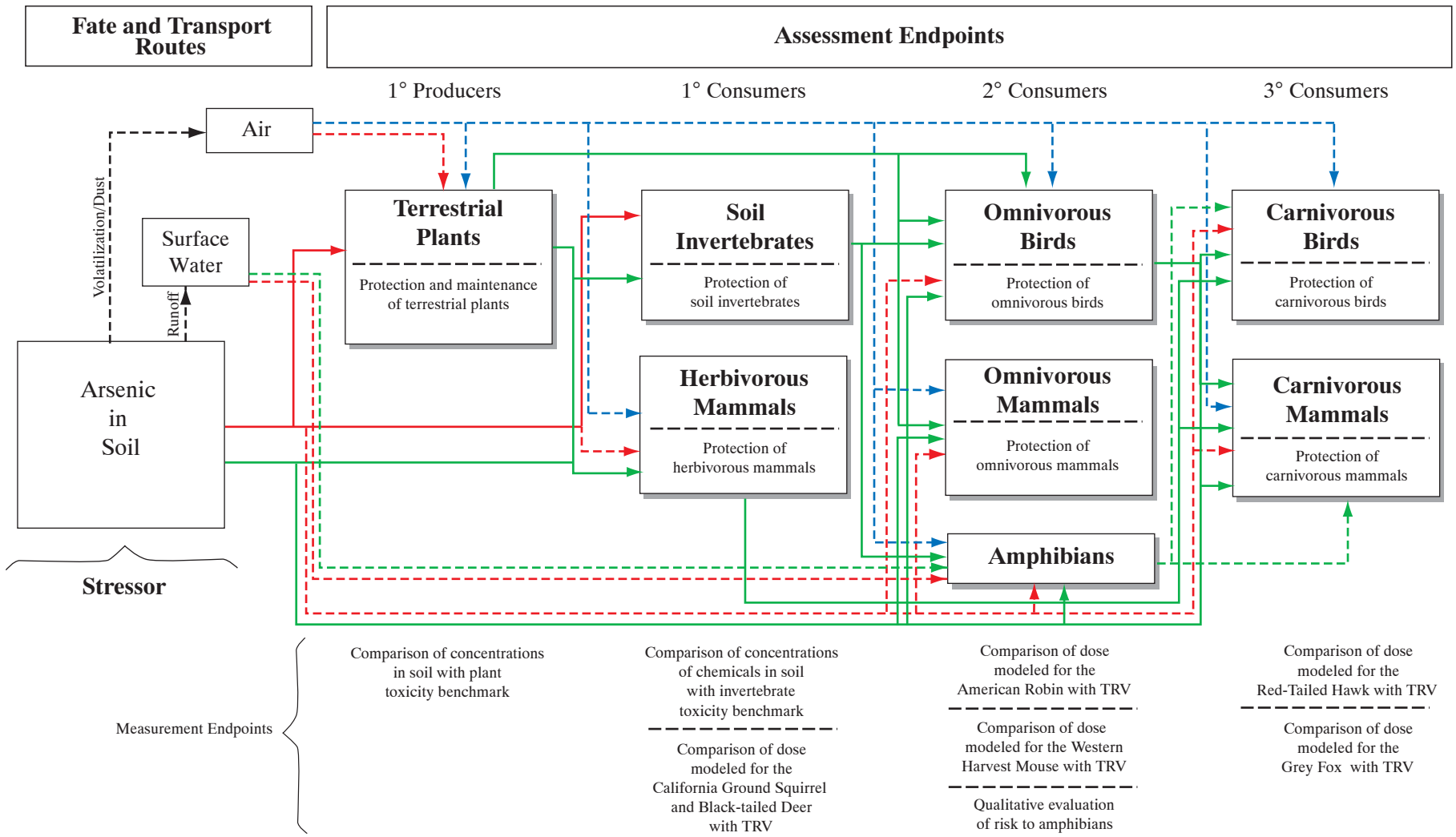
The ecological conceptual site model described in Section H2.2 identifies a complete exposure pathway from soils to plants via direct contact. As a result, risks to plants were evaluated as described in the following sections.

H3.1 EXPOSURE TO PLANTS

The evaluation of risk to plants at Site 22A focused on maintenance of sufficient rates of survival, growth, and reproduction to maintain terrestrial plants. Plants are exposed to chemicals at Site 22A via direct contact with soil. Root uptake is the dominant route for entry of arsenic into terrestrial plants (Hughes 1981). Bioavailability of arsenic for root uptake varies with the oxidation state and the organic composition of the soil. One hundred percent bioavailability was assumed for this SLERA. Exposure estimates for plants at Site 22A were assumed to be the maximum concentration of arsenic detected from 0 to 3 feet bgs at the site.

Arsenic is classified as a metalloid because of its chemical behavior, exhibiting both properties of metals and non-metals, and is well known for its toxicity. In soils, arsenic occurs mainly as inorganic forms, but it can also bind to organic material. In general, arsenic in aerated soils is mostly present as arsenate (As[V]), usually in the form of H_2AsO_4, while under anoxic (that is, waterlogged) conditions it predominately exists as arsenite (As[III]), mostly in the form of undissociated H_3AsO_3 (Porter and Peterson 1977; Haswell and others 1985; Onken and Hossner 1995).

As(V) (arsenate) (H_2AsO_4) is a phosphate analogue, meaning that plants actively take up arsenate or arsenite through the high-affinity phosphate uptake system because it resembles phosphate chemically (Asher and Reay 1979; Ullrich-Eberium and others 1989; Meharg and Macnair 1990, 1992). Since the high affinity phosphate uptake system prefers phosphate over As(V), the uptake of As(V) is strongly dependent on the phosphate availability in the root environment (Meharg and Macnair 1994).



Legend

- Inhalation exposure pathway
- Ingestion exposure pathway
- Direct contact exposure pathway
- Transport route
- (All colors) Minor transport routes and exposure pathways
- Major transport routes and exposure pathways

Note:
Windblown dust was not considered a significant exposure pathway and was not quantitatively evaluated in the screening-level ecological risk assessment.

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FIGURE H-1
ECOLOGICAL CONCEPTUAL SITE MODEL

Appenix H
Remedial Investigation Report for Site 22A

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
20	uncertainty	Section 2.5.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix H: Sections H7.0 through H7.3.9. Tetra Tech. June 1, 2009.

Arsenic will be further evaluated in Step 3a, presented in Section H9.0. Step 3a refines the SLERA and considers less conservative and more realistic site-specific exposure assumptions in the risk calculations (EPA 1997).

H7.0 UNCERTAINTY ANALYSIS

Uncertainty plays an important role in risk-based decision-making and is therefore incorporated explicitly into the risk characterization process. Identifying known sources of uncertainty is a critical component of a SLERA because of the conservative default assumptions that are already incorporated; potential errors are made more explicit in the risk management process by evaluating uncertainties (Suter 1993).

Three sources of uncertainty in ERAs are described in Suter (1993):

1. Mistakes in execution of the assessment (errors such as incorrect measurements, data recording errors, and computational errors)
2. Imperfect knowledge of factors that could be known (ignorance about some aspect of the ecosystem that may be relevant, such as assumptions used in dose models, practical constraints on the ability to measure everything, and lack of knowledge on toxicological effects of all COPECs on all species)
3. Inherent randomness of the world (stochasticity in physical or biological processes that may affect assumptions or actual risk such as variation in population parameters or rainfall patterns)

The ERA process is based on a number of assumptions and extrapolations to evaluate potential risk to ecological receptors. Many of the assumptions in the SLERA process are conservative and result in overestimates of site-specific parameters; however, these assumptions are important to ensure that no COPECs are eliminated when they do pose an adverse ecological risk at a site. The following subsections discuss major uncertainties and conservative assumptions used in this SLERA.

H7.1 ANALYTICAL DATA

Limited data collected from the sites are used to evaluate conditions of the whole site; all concentrations measured are therefore only estimates of concentrations that may occur at the site (with associated error). Estimates of arsenic concentrations in media were based on samples collected from known or suspected contaminated areas at the sites, but were used to characterize conditions throughout the site. This method creates bias in the data toward the more disturbed or affected environments at the site and is likely to overestimate arsenic

concentrations used to characterize conditions throughout the site. Data used to characterize risk at Site 22A included surface (0 to 3 feet bgs) soil samples collected for analysis of arsenic in the five magazine groups. Data from surface and subsurface (0 to 6 feet bgs) soil samples collected were used to analyze effects on the burrowing California ground squirrel. Given the uncertainties associated with sampling in large areas, the sample size of data was adequate to characterize the site.

H7.2 USE OF SCREENING VALUES

The comparison of site-specific maximum concentrations to generic screening values such as Eco-SSLs or ORNL plant and invertebrate benchmarks was used as an indicator of potential adverse effects. Bulk chemistry results from the site likely overestimate the bioavailable fraction. In addition, screening values were not developed using site-specific taxa.

H7.3 UNCERTAINTIES ASSOCIATED WITH THE FOOD CHAIN MODEL

The following discussion highlights uncertainties associated with the food chain model used to evaluate risk to birds and mammals in Section H6.0. The overall effect of these uncertainties and conservative assumptions cannot be quantitatively calculated without site-specific information.

H7.3.1 Tissue Residue Data

Site-specific tissue residue data were not available; thus, prey concentrations were estimated based on literature bioaccumulation factors and other parameters. This approach is generally associated with much more uncertainty than is the approach based on site-specific prey tissue concentrations. In particular, estimates of prey concentration based on literature values do not include accurate predictors of assimilation and depuration of arsenic in the same way as time-averaged tissue concentrations. The estimates of prey concentrations may be either overestimated or underestimated because conditions at the site are likely different from those in the literature.

H7.3.2 Site Use Factors

The SLERA assumed that all receptors live and forage in Site 22A at all times (in other words, the site use factor [SUF] = 1). This assumption is certainly not true for receptors such as the red-tailed hawk, which forages over large areas and is not likely to be consistently exposed to the maximum concentrations of arsenic in soil. Therefore, the actual amount of soil or prey ingested from the site would likely be much less than the values used in the risk calculations. Consequently, the SUFs may result in an overestimate of risk.

H7.3.3 Dietary Composition

The diet of the American robin was assumed to consist of 25 percent plants and 75 percent invertebrates; and the diet of the red-tailed hawk was assumed to be 100 percent small mammals. The diets of the California ground squirrel and black-tailed deer were assumed to consist of 100 percent plants; the diet of the western harvest mouse was assumed to consist of 60 percent invertebrates and 40 percent plants; and the diet of the grey fox was assumed to consist of 100 percent small mammals. These estimates of dietary composition may result in an overestimate or underestimate of risk because of the varied diet of the receptors.

H7.3.4 Bioavailability

Arsenic was conservatively assumed to be 100 percent bioavailable for all receptor. Depending on the receptor, bioavailability may be significantly less than 100 percent. Consideration of bioavailability and bioaccumulation potential of chemicals is important in understanding the risk implications and the potential ecotoxicological effects of total concentrations of chemicals detected in soils. This conservative estimate of 100 percent bioavailability may overestimate risk.

H7.3.5 Body Weight and Ingestion Rates

The range of reported body weights and ingestion rates for wildlife varies significantly in the literature (Beyer and others 1994; Nagy 2001, EPA 1993, 1999a; Pascoe and others 1996; Dunning 1993). These values may not reflect the true attributes of these receptors at Site 22A. The risk may be either overestimated or underestimated, depending on the difference between actual values and literature values.

H7.3.6 Development of TRVs

TRVs used in risk calculations were derived from published studies using a variety of test species. Some TRVs included an adjustment to account for interspecies variability; the applicability of any given TRV to Site 22A is unknown. The use of assessment endpoint species as surrogates for other related or ecologically similar taxa is supported by current guidance (EPA 1992a, 1992b); however, it should be recognized that this type of analysis does not account for differences among taxa and that uncertainty exists with regard to assessments of risk to whole communities based on detailed analyses of relatively few taxa. The effect of this uncertainty cannot be estimated; it could result in either an overestimate or underestimate of risk.

H7.3.7 Interspecies Extrapolation

The use of allometric conversions in interspecies extrapolations has already been discussed. The use of assessment endpoint species as surrogates for other related or ecologically similar taxa is supported by current guidance (EPA 1992a, 1992b); however, this type of analysis does not

account for differences among taxa. In addition, uncertainty exists in assessments of risk to whole communities based on the detailed analysis of relatively few taxa. The use of allometric conversions may result in an overestimate or underestimate of risk.

H7.3.8 Individual and Population Variation

Individuals within a population vary in a number of life history and behavioral traits. The dose models incorporated some of this variability by estimating average values for most model parameters. Most of these models, however, are focused on adult individuals and may not accurately represent ingestion of arsenic by small juvenile stages that may feed in a different manner. Depending on the behavior and proportion of juveniles among the population, the risk may be overestimated or underestimated.

H7.3.9 Use of Maximum Detected Concentration

The maximum concentration of arsenic was used to estimate exposures and to ensure protectiveness. Thus, concentrations in a hot spot, if one existed at the site, were used to characterize conditions throughout the site. However, the maximum concentration is likely to overestimate arsenic concentrations used to characterize conditions throughout the site.

H8.0 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT CONCLUSIONS

Despite the sources of uncertainty described in Section H7.0, adequate information was available to evaluate the potential risk to receptors at Site 22A. As earlier sections have suggested, arsenic was detected at concentrations exceeding benchmark values or levels that result in potential toxicity to representative receptors. Thus, concentrations of arsenic may pose a potential risk to plant, invertebrate, or vertebrate receptors.

According to Navy guidance (1999), an intermediate refinement step may be conducted (Step 3a) if the SLERA indicates unacceptable or uncertain risk. Step 3a reevaluates the conservative exposure assumptions of the SLERA to estimate potential risks. If this reevaluation supports an acceptable risk determination, then no further evaluation of risk is required. If the reevaluation does not support an acceptable risk determination, then the risk evaluation will proceed to a more complete BERA or an action such as a remedial alternative at the site.

The results of the Step 2 SLERA indicated the following for each receptor group:

Plants

- There are potential risks to plants from arsenic at Groups 2 through 5 Magazine Areas at Site 22A.

Invertebrates

- There are potential risks to invertebrates from arsenic at Groups 3 and 5 Magazine Areas at Site 22A.

Amphibians

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
21	Step 3a risk refinement	Section 2.5.2	Final Remedial Investigation Report for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix H: Sections H9.0 through H9.5.1. Tetra Tech. June 1, 2009.

Birds

- Arsenic does not pose potential risk to herbivorous or omnivorous birds at Site 22A, as represented by the surrogate species (American robin and red-tailed hawk).

Mammals

- Concentrations of arsenic pose potential risks to small omnivorous mammals and small herbivorous mammals, as represented by the surrogate species (western harvest mouse and California ground squirrel), at Groups 2 though 5 Magazine Areas at Site 22A.
- Arsenic does not pose potential risk to large herbivorous mammals or carnivorous mammals, as represented by the surrogate species (black-tailed deer and grey fox).

In summary, the SLERA indicates that maximum concentrations of arsenic at Site 22A pose potentially unacceptable risks to plant, invertebrate, and vertebrate receptors based on the conservative assumptions of the SLERA and as summarized in the table below. Arsenic was identified as a preliminary risk driver from Step 2 ($HQ_{[dose/low\ TRV]}>1$) and is further evaluated in the refinement process in Section H9.0. Arsenic $HQ_{[dose/high\ TRV]}$ did not exceed 1 for any receptor.

Magazine Groups where Arsenic is Preliminary Risk Driver for Ecological Receptors from Step 2

Receptor Group	Magazine Group
Plants	Groups 2 though 5
Invertebrates	Groups 3 and 5
Birds	None
Mammals	Groups 2 though 5

H9.0 STEP 3A RISK REFINEMENT

Arsenic was identified as a preliminary risk driver in the SLERA and is reconsidered under Step 3a using less conservative assumptions for a number of parameters in the food chain model. Specific variables assessed include the following:

(1) A statistical comparison to background concentrations was conducted to exclude from further evaluation arsenic concentrations that are not significantly greater than background levels. A description of statistical methods used in the SLERA is provided in Appendix G of the RI Report.

(2) Spatial variations in the exposure point concentration to plants and invertebrates were evaluated quantitatively using the 95 UCL.

(3) HQs were revised based on site-specific information and less conservative receptor-specific assumptions. HQs were calculated using the same methodology as was presented in Sections H3.3, H4.3, and H6.2.2. However, alternative values for select parameters (for example, using the 95 UCL rather than the maximum concentration as the exposure point concentration and using an average rather than a minimum body weight) were used in Step 3a. If the 95 UCL and arithmetic mean concentrations were greater than the maximum concentration for any COPEC, the maximum concentration was also used in the refinement model.

(4) The magnitude of exposure for vertebrate receptors was evaluated by assessing HQ values, background concentrations, the spatial distribution, and the receptor SUF.

(5) The chemical properties and toxicological effects of arsenic were evaluated. Best professional judgment was used in interpreting literature data when information was limited.

The following sections discuss the use of alternative exposure point concentrations and refine the assumptions for arsenic. Section H9.3.1 summarizes the risk at Site 22A from exposure to arsenic that may require further evaluation after Step 3a is complete.

H9.1 BACKGROUND CONCENTRATIONS

Concentrations of arsenic in surface soil were compared with background concentrations in surface soil (0 to 3 feet bgs and 0 to 6 feet bgs) at Site 22A (see Appendix F, Table F-7) to potentially eliminate it as a COPEC. Because arsenic was detected in four out of five magazine group samples at concentrations greater than background samples, it was retained as a COPEC for refinement in Step 3a for plants, invertebrates, and mammals.

Arsenic in Group 1 Magazine Area was not detected at concentrations above background concentrations; it was not retained for further assessment, and will not be discussed in the refinement section.

H9.2 REFINEMENT PARAMETERS

The 95 UCL concentrations in soil for plants and invertebrates were compared with benchmark values as well as alternative benchmark values, if available (see Tables H-4 and H-6). Doses were recalculated for mammals based on the 95 UCL concentration for soil, an average rather than minimum body weight, and a more realistic SUF. Refined arsenic doses were then compared with the TRV to evaluate the risk to each representative receptor that was posed

potential risks in Step 2 of the SLERA (see Table H-7). Revised SUFs were calculated by dividing each magazine group acreage by the foraging range of the receptors to yield a more realistic prediction of the receptors' use of the sites and the resulting exposure to arsenic. The calculations yielded SUFs greater than 1.0 for both the western harvest mouse and the California ground squirrel, so the default value of 1.0 was used.

H9.3 REFINEMENT OF PLANT CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

Step 2 of the SLERA and the Step 3a background screen identified arsenic as the COPEC that poses a potential risk to plants at Site 22A. A focused refined assessment of the ecological risks to plants for arsenic is presented below.

H9.3.1 Evaluation of Arsenic

Arsenic was identified as a COPEC because the maximum concentrations in Groups 2 though 5 Magazine Areas exceeded the Eco-SSL, as presented in Table H-2. The refined HQs for arsenic based on the 95 UCL were 0.98 (Group 2 Magazine Area), 1.87 (Group 3 Magazine Area), 1.27 (Group 4 Magazine Area), and 1.67 (Group 5 Magazine Area). The HQs for Groups 3, 4, and 5 slightly exceed the conservative Eco-SSL.

The EPA calculated the maximum acceptable toxicant concentration, which is the geometric mean of the lowest observed adverse effects concentration (LOAEC) and no observed adverse effects concentration (NOAEC) for the development of the plant Eco-SSL. For ryegrass, Jingh and Singh (1994) reported a NOAEC of 10 and a LOAEC of 50 mg/kg in sandy soil. At arsenic application rates of 50 mg/kg, a reduction in yield was observed. Arsenic concentrations in soils are below the LOAEC for ryegrass in 109 of 116 samples collected from Groups 3, 4, and 5 (Jingh and Sing 1994).

Arsenic uptake is discussed in Section H3.1. The assumption of 100 percent bioavailability likely overestimates risk. Arsenic is most bioavailable in soils of a low clay content and alkaline pH. Soils at Site 22A are generally silty clay or clayey silt (see Appendix C) and although there is no pH data for Site 22A, pH in samples from Site 22 ranged from 6.9 to 7.9, indicating a neutral pH. Arsenic was not detected in the plant tissue samples collected from neighboring Site 22 (above ground tissue only), which is densely vegetated, indicating that it is not likely to affect plants at Site 22A (Tetra Tech 2007a); the maximum arsenic concentrations at Site 22 were three times higher than the maximum concentration at Site 22A.

Based on the lines of evidence presented above, arsenic is not considered to pose unacceptable risk to plants at Site 22A.

H9.4 REFINEMENT OF INVERTEBRATE CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

Step 2 of the SLERA identified arsenic as a COPEC that poses a potential risk to invertebrates at Site 22A. A focused refined assessment of the ecological risks to invertebrates for arsenic is presented below.

H9.4.1 Evaluation of Arsenic

Arsenic was identified as a COPEC because the maximum concentrations in Groups 3 and 5 Magazine Areas exceeded the ORNL earthworm toxicity benchmark for arsenic as presented in Table H-3. The 95 UCLs for Group 3 Magazine Area (33.6 mg/kg) and Group 5 Magazine Area (30.1 mg/kg) did not exceed the earthworm toxicity benchmarks (HQs of 0.56 and 0.50) (Table H-6), indicating that arsenic poses acceptable risk. Based on the refined analysis, arsenic is not considered to pose unacceptable risk to invertebrates at Site 22A.

H9.5 REFINEMENT OF MAMMALIAN CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

After Step 2 of the SLERA, arsenic was identified as a COPEC that poses potential risks to the western harvest mouse and the California ground squirrel at Site 22A. A focused refined assessment of the ecological risk to mammal receptors from arsenic is presented below.

H9.5.1 Results of the Food Chain Model for Mammals Using Refined Exposure Parameters

Arsenic was identified as posing a potential risk to the western harvest mouse in Groups 2 through 5 Magazine Areas. Arsenic was detected in all samples at Site 22A. As presented in Table H-7, western harvest mouse $HQs_{(refined\ dose/low\ TRV)}$ in Groups 2 through 5 Magazine Areas were 0.67, 1.14, 0.83, and 1.04 mg/kg. The $HQs_{(refined\ dose/highTRV)}$ were 0.14, 0.19, 0.15, and 0.19 mg/kg, all well below the effects level. Based on the low HQs and because arsenic is not available in plant tissue at neighboring Site 22, arsenic does not pose unacceptable risks to small omnivorous mammals at Site 22A.

Arsenic was identified as posing a potential risk to the California ground squirrel in Groups 3 and 5 Magazine Areas. California ground squirrel $HQs_{(refined\ dose/low\ TRV)}$ in Groups 3 and 5 Magazine Areas were 0.40 and 0.36 mg/kg. The $HQs_{(refined\ dose/highTRV)}$ were 0.03 mg/kg for both groups, well below the effects level. Based on the low HQs and because arsenic is not available in plant tissue at neighboring Site 22, arsenic does not pose unacceptable risks to small herbivorous mammals at Site 22A.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
22	general response actions (GRA)	Section 2.8	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Section 3.2. ChaduxTt. March 9, 2011.

Based on the evaluation of risks for the residential receptor, IR Site 22A is appropriate for residential (unrestricted) use. EPA guidance states that if "cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 1×10^{-4} and the non-carcinogenic hazard index is less than 1, action generally is not warranted unless there are adverse environmental impacts" (EPA 1991a). Background concentrations of arsenic in soil were evaluated, as well as assumptions regarding the bioavailability of arsenic in soil, and current site conditions are protective for unrestricted use. Furthermore, the cancer risks associated with the arsenic background threshold value of 10 mg/kg are also within the risk management range, and equate to a risk of 3×10^{-5} based on federal toxicity criteria and 2×10^{-4} based on State of California toxicity criteria. It is considered technically infeasible to remediate to concentrations below background.

3.2 General Response Actions

GRAs are broad classes of responses or remedial actions intended to meet the RAO. Similar to RAOs, GRAs are medium-specific; therefore, they are developed in relation to contamination of soil, groundwater, or air. GRAs are derived based on engineering judgment and experience with response actions proven successful for the COCs (arsenic) at IR Site 22A.

GRAs may include no action, institutional controls, removal, containment, treatment, or a combination (EPA 1988). In some cases, response actions may stand alone as complete remedial alternatives, but in many cases, combinations of response actions are necessary to effectively address contamination in soil and meet the RAO.

Four GRAs were identified to achieve the RAO developed for surface soil at IR Site 22A:

- No Action: The NCP requires that the no-action alternative be carried through the detailed analysis of alternatives. Under the no-action alternative, no response actions would be taken. Soil would be left in place without implementing any land use controls (LUC), engineering controls (EC), containment, removal, treatment, or any other mitigating actions.
- Land Use Controls: LUCs are physical, legal, or administrative mechanisms to implement land use and access restrictions to limit the exposure of landowners or users of the property to arsenic-contaminated surface soil. LUCs can also be used to maintain the integrity of a response action. Monitoring and inspections are conducted to assure the land use restrictions are being followed and are effective. LUCs include institutional controls and engineering controls.
    a. Institutional Controls: ICs are restrictive covenants, access restrictions, and land use restrictions.

b. Engineering Controls: ECs, such as exposure prevention covers, are physical barriers used to reduce or eliminate the pathway for potential human exposure to contaminated surface soil. Typically, ECs are used in conjunction with some form of IC to ensure proper monitoring and maintenance of the EC.

- Active Remediation: Remediation includes removal, treatment or stabilization of contamination to minimize or eliminate the potential exposure of humans to contaminated surface soil. Stabilization and treatment processes can directly reduce the toxicity, mobility, or volume of chemicals. Active remediation technologies applicable for arsenic contamination in soil include removal, in situ biological treatment, in situ physical/chemical treatment, and ex situ physical/chemical treatment.

These GRAs are discussed further in Section 4.0 and may be developed into remedial alternatives for IR Site 22A.

3.3 POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CERCLA § 121(d)(l) requires that response actions attain (or the decision document must justify the waiver of) ARARs, which include environmental regulations, standards, or criteria, promulgated under federal or more stringent state laws. An ARAR may be either applicable or relevant and appropriate, but not both. The NCP (40 Code of Federal Regulations [CFR] Part 300) defines applicable and relevant and appropriate as follows:

> *Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically include a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.*
>
> *Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site (relevant) that their use is well suited (and appropriate) to the particular site.*

CERCLA § 121(e) exempts any response action conducted entirely on site from having to obtain a federal, state, or local permit when the action is carried out in compliance with § 121. In addition, on-site actions need only comply with the substantive aspects of ARARs, but not with the corresponding administrative procedures, such as administrative reviews and record-keeping requirements. Off-site actions must comply with all legally applicable requirements, both substantive and administrative.

TABLE B-2: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 2, LAND USE CONTROLS

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor at 2.80%

Year	Future Value of Costs for Alternative 2	Annual Discount Factor[1]	Present Value Cost for Alternative 2	Present Value Cost for Alternative 2
0	$191,343	1	Land Use Control Planning Documents and Implementation	$191,343
5	$123,055	0.871	5-Year Review	$107,185
10	$123,055	0.759	5-Year Review	$93,361
15	$123,055	0.661	5-Year Review	$81,321
20	$123,055	0.576	5-Year Review	$70,833
25	$123,055	0.501	5-Year Review	$61,698
30	$123,055	0.437	5-Year Review	$53,741
			Total Present Value Cost Over 30 Years	**$659,482**

Notes:

1 Annual discount factor = $1/(1+i)^t$, where i=0.028 and t=year (that is, the present value of $1 paid in year t at 2.80%). Annual discount rate obtained from OMB Circluar No. A-94, 2008.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
23	Present-Value Cost: $659,000	Table 5	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B, Table B-2. ChaduxTt. March 9, 2011.

TABLE B-3B: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 3, EXCAVATION AND OFF-SITE DISPOSAL (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor at 2.10%

Year	Future Value of O&M and Periodic Cost for Alternative 3B	Annual Discount Factor[1]	Present Value Cost for Alternative 3	Present Value Cost for Alternative 3
0	$255,947	1	Remedial Design and Planning Documents	$255,947
1	$1,508,808	0.979	Excavation and Off-Site Disposal	$1,477,775
			Total Present Value Cost Over 30 Years	**$1,733,722**

Notes:

1 Annual discount factor = $1/(1+i)^t$, where i=0.021 and t=year (that is, the present value of $1 paid in year t at 2.10%). Annual discount rate obtained from OMB Circluar No. A-94, 2008.

O&M Operation and maintenance

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
24	Present-Value Cost: $1.73 million	Table 5	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B, Table B-3B. ChaduxTt. March 9, 2011.

TABLE B-4B: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 4 EXCAVATION, CONTAINMENT, AND LAND USE CONTROLS (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor for Year 1 Only at 2.10%
Annual Discount Factor for Years 2 through 30 at 2.80%

Year	Future Value of O&M and Periodic Cost for Alternative 4	Annual Discount Factor[1]	Present Value Cost for Alternative 4	Present Value Cost for Alternative 4
0	$425,187	1	Remedial Design, Planning Documents, and LUCs	$425,187
1	$911,463	0.979	:cavation, Containment Unit Construction, Groundwater Monitc	$892,716
2	$26,432	0.946	Site Inspection and Maintenance of Containment Unit	$25,011
3	$26,432	0.920	Site Inspection and Maintenance of Containment Unit	$24,330
4	$26,432	0.895	Site Inspection and Maintenance of Containment Unit	$23,667
5	$167,519	0.871	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$145,914
6	$26,432	0.847	Site Inspection and Maintenance of Containment Unit	$22,396
7	$26,432	0.824	Site Inspection and Maintenance of Containment Unit	$21,786
8	$26,432	0.802	Site Inspection and Maintenance of Containment Unit	$21,192
9	$26,432	0.780	Site Inspection and Maintenance of Containment Unit	$20,615
10	$167,519	0.759	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$127,096
11	$26,432	0.738	Site Inspection and Maintenance of Containment Unit	$19,507
12	$26,432	0.718	Site Inspection and Maintenance of Containment Unit	$18,976
13	$26,432	0.698	Site Inspection and Maintenance of Containment Unit	$18,459
14	$26,432	0.679	Site Inspection and Maintenance of Containment Unit	$17,956
15	$167,519	0.661	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$110,705
16	$26,432	0.643	Site Inspection and Maintenance of Containment Unit	$16,992
17	$26,432	0.625	Site Inspection and Maintenance of Containment Unit	$16,529
18	$26,432	0.608	Site Inspection and Maintenance of Containment Unit	$16,079
19	$26,432	0.592	Site Inspection and Maintenance of Containment Unit	$15,641
20	$167,519	0.576	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$96,428
21	$26,432	0.560	Site Inspection and Maintenance of Containment Unit	$14,800
22	$26,432	0.545	Site Inspection and Maintenance of Containment Unit	$14,397
23	$26,432	0.530	Site Inspection and Maintenance of Containment Unit	$14,005
24	$26,432	0.515	Site Inspection and Maintenance of Containment Unit	$13,624
25	$167,519	0.501	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$83,992
26	$26,432	0.488	Site Inspection and Maintenance of Containment Unit	$12,892
27	$26,432	0.474	Site Inspection and Maintenance of Containment Unit	$12,540
28	$26,432	0.462	Site Inspection and Maintenance of Containment Unit	$12,199
29	$26,432	0.449	Site Inspection and Maintenance of Containment Unit	$11,867
30	$167,519	0.437	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$73,159
			Total Present Value Cost Over 30 Years	**$2,360,658**

Notes:

1 Annual discount factor = 1/(1+i)t, where i=0.021 or 0.028 and t=year (that is, the present value of $1 paid in year t at 2.01% or 2.08%). Annual discount rates obtained from OMB Circluar No. A-94, 2008.

O&M Operation and maintenance

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
25	Present-Value Cost: $2.36 million	Table 5	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B, Table B-4B. ChaduxTt. March 9, 2011.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
26	Cost	Section 2.8.2	Final Feasibility Study for Installation Restoration Site 22A. Naval Weapons Station Seal Beach Detachment Concord, Concord, California. Appendix B. ChaduxTt. March 9, 2011.

APPENDIX B
REMEDIAL ALTERNATIVES COST SUMMARY AND ASSUMPTIONS

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ACRONYMS AND ABBREVIATIONS

APP	Accident prevention plan
BCY	Bank cubic yard
bgs	Below ground surface
CAMU	Corrective action management unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CY	Cubic yards
EPA	U.S. Environmental Protection Agency
FS	Feasibility study
HASP	Health and safety plan
IR	Installation Restoration
LUC	Land use control
LUC RD	Land use control remedial design
MEP	Multiple Extraction Procedure
mg/kg	Milligram per kilogram
NAVWPNSTA	Naval Weapons Station
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and maintenance
OMB	Office of Management and Budget
QAPP	Quality assurance project plan
RACER	Remedial action cost engineering and requirements system
RAO	Remedial Action Objective
RD	Remedial design
ROD	Record of Decision
SAP	Sampling and analysis plan
TCLP	Toxicity characteristic leaching procedure
WET	Waste extraction test

B1.0 INTRODUCTION

This appendix provides an initial estimate of costs associated with remedial alternatives for Installation Restoration (IR) Site 22A, located in the Inland Area of the former Naval Weapons Station Seal Beach Detachment Concord (NAVWPNSTA Concord), in Concord, California. The alternatives were developed and evaluated as part of this Feasibility Study (FS). IR Site 22A consists of 504 acres divided into five subareas know as the Groups 1 through 5 Magazine Areas; it includes 103 munitions storage magazines connected by roads and railroad spurs and surrounding open grassland. The Department of the Navy used the magazines to store munitions and explosives from the mid-1940s to 2001.

Cost estimates are developed as part of an FS to compare remedial alternatives during the remedy selection process, and not to establish project budgets or to negotiate Superfund enforcement settlements. The cost estimate is typically carried over from the FS to the Proposed Plan for public comment during remedy selection. The cost estimate in the Record of Decision (ROD) reflects any changes to the remedial alternative that occurred during the remedy selection process as a result of new information or public comment (U.S. Environmental Protection Agency [EPA] 2000).

Costs and components of the technologies were derived from the Remedial Action Cost Engineering and Requirements System (RACER) software developed by AECOM for the U.S. Army and Air Force for cost estimating (AECOM 2008). The components of the cost estimate are described in Section B2.0. Section B3.0 describes the remedial alternatives and the major assumptions for the cost estimates for each alternative. The costs are summarized in Section B4.0. Documents and supporting information used to prepare the cost estimates in this appendix are listed in Section B5.0.

B2.0 COST ESTIMATE COMPONENTS

Cost estimates for the remedial alternatives include capital costs, future value annual operations and maintenance (O&M) costs, future value total periodic costs, and total present value costs. Each component is discussed in further detail in the following sections.

B2.1 CAPITAL COSTS

Capital costs include direct and indirect costs. Costs incurred for equipment, material, labor, construction, development, and implementation of remedial technologies are included as direct costs. Indirect costs include health and safety items, site supervision, engineering, overhead and profit, and startup. Indirect costs are included in the estimate either as a separate line item or as a percentage of the direct capital cost.

B2.2 ANNUAL OPERATION AND MAINTENANCE OR PERIODIC COSTS

Annual O&M costs include costs incurred after construction. These costs are necessary to assure the effectiveness of a response action. Annual O&M costs typically include labor, consumable

materials, purchased services (for example, laboratory analysis), sampling, permit fees, annual reports, and site reviews.

Periodic costs occur once every few years or once during the entire O&M period. Examples include 5-year reviews and site closeout.

B2.3 PRESENT VALUE ANALYSIS

Remedial actions typically involve construction costs expended at the beginning of a project (capital costs) and costs in subsequent years (O&M or periodic costs). Present value analysis is a method to evaluate expenditures that occur over different periods. This standard methodology allows for cost comparisons of different remedial alternatives on the basis of a single cost figure for each alternative. This single value, referred to as the present value, represents the investment required at the beginning of the project (the base year) to assure sufficient funds will be available for the expected duration of the project. The present value analysis uses a discount rate and period of analysis to calculate the present value of all future expenditures.

B2.3.1 Discount Rate

A discount rate is the difference between current interest rates and inflation. When inflation is neglected, the discount rate is simply an interest rate and is used to account for the time value of money. A dollar is worth more today than in the future because the dollar would earn interest if invested today. The choice of a discount rate is important because the rate selected directly affects the present value of a cost estimate, which is then used in making a remedy selection decision.

EPA policy on use of discount rates for cost analysis is set forth in the preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (55 Federal Register 8722) and in Office of Solid Waste and Emergency Response Directive 9355.3-20 (EPA 1993). Discount rates used in economic analysis by the federal government are specified in Office of Management and Budget (OMB) Circular A-94. The current discount rate for a 3-year stream of payments is 2.1 percent and for a 30-year stream of payments is 2.8 percent (OMB 2008).

B2.3.2 Present Value

The present value of a series of equal annual future payments, such as annual O&M payments, is calculated using the following equation:

$$PV = \sum_{t=1}^{n} \frac{x_t}{(1+i)^t}$$

where:

PV	=	Present value
x_t	=	Payment in year t (t = 0 for present or base year)
i	=	Discount factor
t	=	Number of years after construction that expenditures start
n	=	Number of years that the stream of equal annual future payments will run

The present value of a single periodic future payment is calculated using the following equation:

$$PV = \frac{x_t}{(1+i)^t}$$

where:

PV	=	Present value
x_t	=	Payment in year t (t = 0 for present or base year)
i	=	Discount factor
t	=	Number of years after construction that expenditures occur

The present value of a remedial alternative represents the sum of the present values of all future payments associated with the project. The present value for this cost estimate is calculated using 2010 dollars.

B2.4 TYPES OF COST ESTIMATING METHODS

The cost estimates presented in this appendix were developed using both detailed and parametric approaches, both of which are accepted by EPA, as described below.

"The detailed approach estimates cost on an item-by-item basis. Detailed methods typically rely on quantity take-offs and compiled sources of unit cost data for each item, taken from either a built-in database (if part of a software package, for example) or other sources (e.g., cost estimating references). This method, also known as 'bottom up' estimating, is used when design information is available" (EPA 2000).

"The parametric approach relies on relationships between cost and design parameters. These relationships are usually 'statistically-based' or 'model-based.' Statistically-based approaches rely on 'scaled-up' or 'scaled-down' versions of projects where historical cost data is available. Model-based approaches utilize a generic design that is linked to a cost database and adjusted by the user for site-specific information. This method, also known as 'top down' estimating, is used when design information is not available" (EPA 2000).

B2.5 METHODOLOGY

Cost estimates for this FS were prepared in accordance with the "Guide for Developing and Documenting Cost Estimates during the Feasibility Study" (EPA 2000). RACER version 10.2 software (AECOM 2008) in conjunction with RACER version 10.3 software (AECOM 2009) were the primary sources of unit costs. Costs obtained from RACER 10.2 were updated to 2010 dollars by applying an escalation factor of 1.078, derived using RACER 10.3. Costs for unique line items not included in RACER were based on vendor quotes, such as landfill disposal costs.

B2.6 COST ESTIMATE PRESENTATION

The quantities presented are estimates and will likely vary as the remedial design (RD) progresses and construction occurs. This cost estimate is judged accurate within the minus 30 percent, plus 50 percent accuracy required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Table B-1 summarizes the costs for each soil alternative. Present value calculations are presented in Tables B-2 through B-4B. Cost details are presented in Tables B-5 through B-7B. EPA guidance (EPA 1988) states: "The period of performance for costing purposes should not exceed 30 years for the purpose of the detailed analysis." Therefore, detailed costs (Tables B-5 through B-7B) are based on a period of performance of up to 30 years.

B3.0 INTRODUCTION TO REMEDIAL ALTERNATIVES

The remedial alternatives selected include:

- Alternative 1: No Action
- Alternative 2: Land Use Controls
- Alternative 3: Excavation and Off-Site Disposal
- Alternative 4: Excavation, Containment, and Land Use Controls

The remedial alternatives and the cost assumptions for each alternative are described in the following sections.

B3.1 ALTERNATIVE 1: NO ACTION

Alternative 1, no action, provides a baseline for comparison with the other alternatives. Using federal toxicity criteria, Groups 2 through 5 Magazine Areas are currently appropriate for unrestricted use, and the remedial action objective (RAO) is met. However, risk results based on State of California toxicity criteria suggest remedial alternatives that could reduce risk should be considered. Under this alternative, no response actions would be conducted. No attempts would be made to monitor or control exposure to arsenic in surface soil. Additionally, no costs are associated with this alternative.

B3.2 ALTERNATIVE 2: LAND USE CONTROLS

Under Alternative 2, land use controls (LUC) would be implemented through access restrictions, land use restrictions, and covenants to restrict use of property. The LUCs would prohibit residential use of Groups 2 through 5 Magazine Areas of IR Site 22A. Although cancer risks in Group 2 considering both federal and State of California toxicity criteria are within the risk management range, the costs to include Group 2 in Alternative 2 are negligible, so it was included. A land use control remedial design (LUC RD) would be prepared that describes the specific LUC implementation actions, including requirements for 5-year remedy reviews under CERCLA; frequency of and requirements for periodic monitoring or visual inspection; notification procedures to the regulatory agencies for planned property conveyance; corrective action requirements or responses to actions inconsistent with the LUCs; a list of LUCs with expected durations; and maps identifying where the LUCs are to be implemented. Long-term O&M would include 5-year reviews to evaluate the protectiveness of the alternative.

The following assumptions were made for Alternative 2:

- LUCs will include preparation of a LUC RD and 5-year reviews. Annual inspections will not be necessary. The specific LUCs for IR Site 22A will be detailed in the ROD. LUCs would be in place indefinitely, or until other actions are taken to support unrestricted future uses of the property or portions of the property.
- Implementation of the LUCs will require preparation of planning documents, planning meetings with the Navy and other stakeholders at IR Site 22A, and implementation of the LUCs, including surveying and mapping the area subject to LUCs.
- Five-year reviews will be required consisting of document review, a site visit and inspection, interviews with facility personnel, and a report.

Table B-2 provides the present value costs and Table B-5 provides the itemized costs associated with this alternative.

B3.3 ALTERNATIVE 3: EXCAVATION AND OFF-SITE DISPOSAL

This alternative involves excavation and off-site disposal of surface soil (0 to 0.5 foot below ground surface [bgs]) that may pose an unacceptable risk to humans under a residential scenario. Arsenic at concentrations in surface soil that may pose a risk to future residents would be excavated. Contaminated soil would be transported off site to a licensed disposal facility. Two scenarios were evaluated for this alternative: the first considers removal of soil with arsenic at concentrations above 39 mg/kg, and the second considers removal of soil with arsenic at concentrations above 22 mg/kg. Approximately 4,800 bank cubic yards (BCY) (in-place yards) of soil would be excavated under the first scenario from areas totaling approximately 6.5 acres. Approximately 6,200 BCY of soil would be excavated under the second scenario from areas totaling approximately 7.4 acres. For costing, the excavation was assumed to be to 0.5 foot bgs. Soil would be excavated from the top of the munitions magazines and within a radius of about 50 feet of the magazines. The magazines and existing

roadways would not be demolished for this alternative, and soil would not be excavated from beneath the existing structures and pavement because the arsenic was applied to the site to prevent the growth of vegetation around the munitions magazines (Tetra Tech EM Inc. 2009). Therefore, it is assumed that arsenic is not present under existing buildings or roads.

After soil is excavated, soil samples would be collected around the perimeter and along the floor of the excavation and analyzed for arsenic to confirm concentrations remaining at the magazine area meet the RAO. If the confirmation samples show concentrations of arsenic meet the RAO, the excavations would be backfilled with clean soil. If arsenic concentrations do not meet the RAO, the excavations would be expanded laterally or vertically and additional confirmation samples would be collected. This process would be repeated until the RAO is met. The cost estimate assumes that additional excavation would not be required based on the confirmation samples. The excavated areas would be backfilled with clean material and returned to approximately existing grades.

The stockpiled soil would be sampled for waste characterization before transport via truck to a licensed off-site disposal facility. The contaminated soil may be pretreated at the treatment and disposal facility to achieve the most economical disposal option. However, based on the contaminant of concern (arsenic) and its expected concentration, the soil would not require pretreatment and could be disposed as a nonhazardous waste. This cost estimate assumes soil would be disposed as a nonhazardous waste and would not be pretreated before disposal.

The California tiger salamander, which is federally and state listed as threatened, and the California red legged frog, which is state listed as threatened, could be present at the site, and protection measures would be required. The Navy does not know exactly what the required protection measures will be for the frogs and salamanders. For cost estimating, it was assumed that a biological assessment and salamander trapping and fencing will be required. The costs presented are expected to be adequate to cover protection measures for the frogs and salamanders.

Tables B-3A and B-3B provide the present value costs, and Tables B-6A and B-6B present the itemized costs associated with this alternative.

The following assumptions were made for Alternative 3:

General

- This alternative will include preparing planning documents, including a RD, accident prevention plan (APP) and health and safety plan (HASP), contingency plan, quality assurance project plan (QAPP), and sampling and analysis plan (SAP), as appropriate. Professional labor management will include permitting, construction oversight and management, preparation of as-built drawings, and reporting. Planning for and construction of this alternative are expected to require less than 3 years to complete.
- The intent of Alternative 3 is to achieve unrestricted use of the site. It is assumed that the RAO will be met without the need for engineering controls or LUCs.

Excavation

- Soil will be excavated to a depth of 0.5 foot bgs.
- Two scenarios were considered. Soil excavation of arsenic at concentrations above 39 milligrams per kilograms (mg/kg) would require a total of 6.5 acres be cleared and grubbed for mobilizing heavy equipment into the area, excavation, and placement of the stockpiled soil. Soil excavation of arsenic at concentrations above 22 mg/kg would require a total of 7.0 acres be cleared and grubbed.
- Only light vegetation exists in the clear-and-grub areas; no trees or stumps will be disturbed.
- Excavation will include preparation of decontamination facilities, stockpile areas, and contractor laydown areas, and mobilization of equipment and personnel to the former NAVWPNSTA Concord.
- Soil beneath existing buildings, munitions magazines, roadways, or other paved areas will not be disturbed. However, excavated soil will include soil on top of the munitions magazines; approximately 0.5 foot of soil will be scraped off of the magazines. This alternative does not include demolition of site features, including existing magazines, buildings, roads, pavement, and so forth.
- Soil excavated from the vegetated areas of IR Site 22A will be removed with a scraper. Soil will be scraped off of the magazines and excavated near pavement or other site features with an excavator. Removal of soil with arsenic at concentrations above 39 mg/kg would require excavation of an estimated 4,800 BCY from the magazines and the vegetated areas. Removal of soil with arsenic at concentrations above 22 mg/kg would require excavation of an estimated 6,200 BCY.
- Excavation will not require utility clearance or abandonment before construction; no overhead utilities, such as power lines, at IR Site 22A will need to be disconnected or removed before construction.
- Excavated soil will be stockpiled before it is loaded onto trucks for transport to the disposal facility.
- The excavated areas will be backfilled with clean soil, obtained from an off-site location; backfill material will be spread and compacted to match existing grades and drainage.
- Disturbed areas will be reseeded with native cover; vegetative cover will be watered and mowed 10 times to establish growth.
- Decontamination facilities will be constructed on site, and decontamination waste will be containerized and disposed of at Altamont Landfill as nonhazardous waste.

Sampling

- Waste characterization sampling includes toxicity characteristic leaching procedure (TCLP) and waste extraction test (WET) analysis at a frequency of one four-point composite sample every 2,500 cy of excavated soil; approximately four samples will be collected for waste characterization if excavation of soil with arsenic at concentrations above 39 mg/kg is selected. Approximately five samples will be collected for waste characterization if excavation of soil with arsenic at concentrations above 22 mg/kg is selected.

- Soil confirmation samples will be collected from the perimeter and floor of each excavation area and analyzed for arsenic to confirm concentrations meet the RAO. Samples will be collected approximately every 200 feet along the excavation perimeter.

  – If excavation of arsenic at concentrations above 39 mg/kg is selected, nine magazines will be excavated; the perimeter of all nine excavation areas is estimated at 4,363 linear feet. In addition, samples will be collected approximately every 3,000 square feet of excavation floor; the total area of excavation floors is estimated at 249,000 square feet. Therefore, a total of 115 confirmation samples (including quality assurance samples) will be collected.

  – If excavation of arsenic at concentrations above 22 mg/kg is selected, 12 magazines will be excavated; the perimeter of all 12 excavation areas is estimated at 5,647 linear feet. In addition, samples will be collected approximately every 3,000 square feet of excavation floor; the total area of excavation floors is estimated at 323,800 square feet. In addition, two *de minimis* areas (GP3SD002 and MAGSCB002) will require remediation, and one confirmation sample will be collected on each side wall and one confirmation sample will be collected on the excavation floor for each *de minimis* area. Therefore, a total of 161 confirmation samples (including quality assurance samples) will be collected.

- Confirmation sampling results will indicate arsenic concentrations meet the RAO, and further excavation will not be necessary.

Off-Site Disposal

- It is assumed excavated soil will be disposed of as nonhazardous waste at Altamont Landfill because of the relative immobility of arsenic in soil. Pretreatment will not be necessary.

- The excavated soil will be loaded onto trucks and transported to Altamont Landfill, 40 miles from the former NAVWPNSTA Concord.

- Transportation and disposal costs are $36 per ton of waste. A conversion factor of 1.5 tons per cubic yard of soil in place was used to calculate the tons of soil for disposal.

- Cash bond to the City of Concord assumes $100,000 will be required to repair damage to city streets from hauling of excavated soil and backfill.

Pre-Excavation Biological Assessment

- A pre-excavation biological assessment will be conducted at the site that will guide the development of the biological avoidance, minimization, and mitigation measures to be implemented.

Salamander Protection

- Nine areas will be excavated if scenario 1 is selected, and 5,400 linear feet of perimeter fencing will be needed for the nine excavation areas in Groups 2 through 5 Magazine Areas. Fourteen areas (12 magazines and two *de minimis* areas) will be excavated if scenario 2 is selected, and 7,440 linear feet of perimeter fencing will be needed for the 14 excavation areas in Groups 2 through 5 Magazine Areas.

- Traps will be set 30 feet apart (180 traps total) in the evening and picked up the next morning for each rain event. Trap setup will take approximately 4 minutes per trap, and pickup will require approximately 6 minutes per trap (30 hours total to set and pick up traps per rain event). One permitted biologist must be on site during trap collection.

- It is assumed that 35 days of trapping will be required from December 15 through March 15. Trapping must take place when the National Oceanic and Atmospheric Administration (NOAA) predicts 70 percent or more chance of rain.

- A permitted biologist must be present during fence set up, trapping, and during any excavation or construction.

B3.4 ALTERNATIVE 4: EXCAVATION, CONTAINMENT, AND LAND USE CONTROLS

In Alternative 4, surface soil (0 to 0.5 foot bgs) that may pose an unacceptable risk to humans under the residential use scenario would be excavated and placed in a containment unit or corrective action management unit (CAMU). As with Alternative 3, two excavation scenarios were evaluated (excavation of arsenic at concentrations above 39 mg/kg and excavation of arsenic at concentrations above 22 mg/kg). The areas planned for excavation under the two scenarios include estimated volumes of 4,800 BCY and 6,200 BCY. This alternative includes the same excavation, confirmation sampling, and backfilling methods as Alternative 3.

An on-site CAMU would be constructed for permanent disposal of the excavated soil. LUCs would be implemented for the CAMU to maintain the effectiveness of the alternative. The remainder of the site would be available for unrestricted use. This alternative also includes long-term maintenance, monitoring, and 5-year reviews of the CAMU.

The excavated soil would be hauled to the expected location of the CAMU. The excavated soil would be placed on the existing grade, and the CAMU would extend approximately 10 feet above the existing grade. The sides of the CAMU would be sloped to promote drainage to the exterior edges of the unit. The CAMU would not require a liner or leachate collection system, as discussed in the FS, because the relatively low arsenic concentrations in soil are relatively immobile in the clayey soils at IR Site 22A and would not migrate into groundwater or surface water. The cover of the CAMU would consist of 0.5 foot of clean soil to prevent exposure of humans to contaminated soil. The CAMU would cover approximately 1.0 acre under the first scenario and 1.3 acres under the second scenario (approximately 6,300 loose cubic yards [CY] and 8,000 loose CY).

Construction of the CAMU would require installation of groundwater monitoring wells within or around the CAMU and periodic collection of samples from these wells. Although arsenic in surface soil at IR Site 22A is believed to be relatively immobile and would not migrate to groundwater, a groundwater monitoring program is required by the RCRA CAMU regulations, Cal. Code Regs. tit. 22, § 66264.552(c) and (e). Five new groundwater monitoring wells would be installed (two downgradient, one upgradient, and two crossgradient), and groundwater samples would be collected from the wells once every 5 years and analyzed for arsenic.

The period of performance of 30 years was used to assess the containment unit maintenance and monitoring costs. LUCs would be implemented to restrict residential use of the area to protect the integrity of the containment unit.

The California tiger salamander, which is federally and state listed as threatened, and the California red legged frog, which is state listed as threatened, could be present at the site, and protection measures would be required. The Navy does not know exactly what the required protection measures will be for the frogs and salamanders. For cost estimating, it was assumed that salamander trapping and fencing will be required. The costs presented are expected to be adequate to cover protection measures for the frogs and salamanders.

Tables B-4A and B-4B provide the present value costs, and Tables B-7A and B-7B present the itemized costs associated with this alternative.

The following assumptions were used to evaluate and estimate the cost of Alternative 4:

General

- Alternative 4 will include preparing planning documents, including an RD, APP and HASP, contingency plan, and SAP, as appropriate.
- Professional labor management will include permitting, construction oversight and management, preparation of as-built drawings, and reporting.
- Planning and construction will require less than 2 years to complete; O&M of the CAMU and monitoring and enforcement of the LUCs will be conducted as long as required, but the cost estimate was based on a period of performance of 30 years in accordance with EPA guidance (EPA 1988).

Land Use Controls

- LUCs will include preparation of an LUC RD and 5-year reviews. Annual inspections of the LUCs will be implemented with inspections and monitoring of the CAMU. The specific LUCs for IR Site 22A will be detailed in the ROD. LUCs would be in place indefinitely.
- Implementation of the LUCs will require preparation of planning documents, planning meetings with Navy and other stakeholders at IR Site 22A, and implementation of the LUCs, including surveying and mapping the area subject to LUCs.
- Five-year reviews will be required and will consist of document review, a site visit and inspection, interviews with facility personnel, and a report.
- The description and location of the CAMU will be recorded in the geographic information system database for the former NAVWPNSTA Concord so the LUCs can be tracked and enforced.

Excavation

- Soil will be excavated to a depth of 0.5 foot bgs to meet the RAO.
- Two scenarios were considered. Soil excavation of arsenic at concentrations above 39 mg/kg would require a total of 6.5 acres be cleared and grubbed for mobilizing heavy equipment into the area, excavation, and placement of the soil in a CAMU. Soil excavation of arsenic at concentrations above 22 mg/kg would require a total of 7.0 acres be cleared and grubbed.
- Only light vegetation exists in the clear-and-grub areas; no trees or stumps are present in the areas will be disturbed.
- Excavation will include preparation of decontamination facilities, and contractor laydown areas, and mobilization of equipment and personnel to the former NAVWPNSTA Concord.
- Soil beneath existing buildings, munitions magazines, roadways, or other paved areas will not be disturbed. The demolition of these features will not be required. It is assumed approximately 0.5 foot of soil will be scraped off of the arsenic-contaminated magazines.
- Soil excavated from the vegetated areas of IR Site 22A will be removed with a scraper. Soil will be scraped off of the magazines and excavated near pavement or other site features with an excavator. Removal of soil with arsenic at concentrations above 39 mg/kg would require excavation of an estimated 4,800 BCY from the magazines and vegetated areas. Removal of soil with arsenic at concentrations above 22 mg/kg would require excavation of an estimated 6,200 BCY from the magazines and the vegetated areas.

- Excavation and construction of the CAMU will not require clearance or abandonment of underground utilities.
- No overhead utilities, such as power lines, are at IR Site 22A that need to be disconnected or removed before construction.
- Excavated soil will be placed directly into the CAMU area and spread.
- The excavated areas outside the CAMU area will be backfilled with clean soil, obtained from an off-site location. Backfill material will be spread and compacted to match existing grades and drainage.
- Disturbed areas will be reseeded with native cover. Vegetative cover will be watered and mowed 10 times to establish growth.
- Decontamination facilities will be constructed on site. Decontamination waste will be containerized and disposed of at Altamont Landfill as nonhazardous waste.

Sampling

- Soil confirmation samples will be collected from the perimeter and floor of each excavation area and analyzed for arsenic to confirm concentrations meet the RAO. Samples will be collected approximately every 200 feet along the excavation perimeter. In addition, confirmation floor samples will be collected for approximately every 3,000 square feet of excavation floor. Confirmation sampling results will indicate arsenic concentrations meet the RAO and further excavation will not be necessary.
  - If excavation of arsenic at concentrations above 39 mg/kg is selected, nine magazines will require remediation; the perimeter of all nine excavation areas is estimated at 4,363 linear feet. In addition, samples will be collected approximately every 3,000 square feet of excavation floor area; the total area of excavation floors is estimated at 249,000 square feet for all nine excavation areas. Therefore, a total of 115 confirmation samples (including quality assurance samples) will be collected.
  - If excavation of arsenic at concentrations above 22 mg/kg is selected, 12 magazines will require remediation; the perimeter of all 12 excavation areas is estimated at 5,650 linear feet. The total area of excavation floors is estimated at 324,000 square feet. In addition, two *de minimis* areas (GP3SD002 and MAGSCB002) will require remediation, and one confirmation sample will be collected on each side wall and one confirmation sample will be collected on the excavation floor for each *de minimis* area. Therefore, a total of 161 confirmation samples (including quality assurance samples) will be collected.

Construction of CAMU

- If excavation of arsenic at concentrations above 39 mg/kg is selected, a total of 4,800 BCY of excavated soil will be placed within the CAMU. If excavation of arsenic at concentrations above 22 mg/kg is selected, a total of 6,200 BCY of excavated soil will be placed within the CAMU.
- The CAMU will be no more than 10 feet above existing grade. The surface of the CAMU will be graded to promote drainage to the exterior edges of the CAMU. If excavation of arsenic at concentrations above 39 mg/kg is selected, the CAMU will require approximately 1 acre, including the area necessary to slope the edges to existing grade (estimated at a 4 to 1 slope). If excavation of arsenic at concentrations above 22 mg/kg is selected, the CAMU will require approximately 1.3 acres.
- Excavated soil will be placed on existing grade. No excavation will be necessary for construction of the CAMU. The CAMU will be located on undeveloped land; therefore, no demolition of magazines or roadways or utility clearance will be required.
- The CAMU will not require a liner because arsenic is immobile in soil. The cover of the CAMU is designed only to prevent direct contact with the contaminated soil and will consist of 0.5 foot of clean fill material from off site. The cover will be revegetated with native plants and watered 10 times to establish growth.
- Five groundwater monitoring wells will be installed within or around the CAMU, as required by Title 40 Code of Federal Regulations Section 264.552(e). These groundwater wells will be monitored for arsenic contamination, as described under "Long-Term O&M of CAMU."

Long-Term O&M of CAMU

- A period of performance of 30 years was used to assess the CAMU cover maintenance and monitoring; maintenance and monitoring would continue as long as the CAMU is in place.
- The CAMU will be inspected annually for cracks, depressions, or damage to the soil cover that may result in exposure of humans to arsenic-contaminated soil; the CAMU will require maintenance once every year to repair minor damage and to reseed areas of the cover.
- One groundwater sample will be collected from each of the groundwater monitoring wells once every 5 years and analyzed for arsenic. The results of the groundwater samples will be reported in the 5-year review report.

Pre-Excavation Biological Assessment

- A pre-excavation biological assessment will be conducted at the site that will guide the development of the biological avoidance, minimization, and mitigation measures to be implemented.

Salamander Protection

- Nine areas will be excavated around magazines if scenario 1 is selected, and 5,400 linear feet of perimeter fencing will be needed for the nine excavation areas in Groups 2 through 5 Magazine Areas. Fourteen areas (12 magazines and two *de minimis* areas) will be excavated if scenario 2 is selected, and 7,440 linear feet of perimeter fencing will be needed for the 14 excavation areas in Groups 2 through 5 Magazine Areas.
- Traps will be set 30-feet apart (180 traps total) in the evening and picked up the next morning for each rain event. Trap setup will take approximately 4 minute per trap, and pickup will require approximately 6 minutes per trap (30 hours total to set and pick up traps per rain event). A permitted biologist must be on site during trap collection.
- Trapping will be required from December 15 through March 15, a total of 35 days. Trapping must take place whenever NOAA predicts 70 percent or more chance of rain.
- A permitted biologist must be present during fence set up, trapping, and during any excavation or construction.

B4.0 COST SUMMARY

Table B-1 summarizes the costs for each remedial alternative. These costs include capital cost, future value annual O&M cost, future value total periodic cost, and total present value cost. Tables B-2 through B-4B summarize the present value analysis of future costs for the alternatives. The itemized costs of the alternatives are presented in Tables B-5 through B-7B.

The total 2010 cost for each alternative is summarized below:

Remedial Alternative	Total Present Value Cost	
	Excavation of Arsenic Concentrations above 39 mg/kg	Excavation of Arsenic Concentrations above 22 mg/kg
Alternative 2, Land Use Controls	$659,000*	
Alternative 3, Excavation and Off-Site Disposal	$1,531,000	$1,734,000
Alternative 4, Excavation, Containment, and Land Use Controls	$2,251,000	$2,361,000

Note:

* Alternative 2 costs do not include excavation; therefore, whether excavations are based on 39 mg/kg or 22 mg/kg is not applicable.

Alternative 2: The estimated 30-year total present value cost for Alternative 2 is $659,000. Capital costs include preparation of the LUC RD and other legal documents to implement the LUCs ($191,000). Future value periodic costs include enforcement of the LUCs and 5-year reviews ($123,000).

Alternative 3: If excavation of arsenic at concentrations above 39 mg/kg is selected, the estimated 2-year (total duration for remedial action) total present value cost for Alternative 3 is $1,531,000. Capital costs include RD and planning documents ($226,000). Periodic costs (year 1 only) include excavation, transportation, disposal of the contaminated soil, confirmation sampling, and backfilling the excavations ($1,332,000). O&M or periodic costs (beyond year 1) would not be required because surface soil that poses an unacceptable risk to humans would be permanently removed.

If excavation of arsenic at concentrations above 22 mg/kg is selected, the estimated 2-year (total duration for remedial action) total present value cost for Alternative 3 is $1,734,000. Capital costs include RD and planning documents ($256,000). Periodic costs (year 1 only) include excavation, transportation, disposal of the contaminated soil, confirmation sampling, and backfilling the excavations ($1,509,000).

Alternative 4: If excavation of arsenic at concentrations above 39 mg/kg is selected, the estimated 30-year total present value cost for Alternative 4 is $2,251,000. Capital costs include RD and planning documents and LUC RD ($406,000). Future value annual O&M ($26,000) and future value total periodic costs ($820,000 year 1 only for excavation and CAMU construction, and $168,000 every 5 years) include long-term maintenance and monitoring of the CAMU, enforcement of the LUCs, and 5-year reviews.

If excavation of arsenic at concentrations above 22 mg/kg is selected, the estimated 30-year total present value cost for Alternative 4 is $2,361,000. Capital costs include RD and planning documents and LUC RD ($425,000). Future value annual O&M ($26,000) and future value total periodic costs ($911,000 year 1 only for excavation and CAMU construction, and $168,000 every 5 years) include long-term maintenance and monitoring of the CAMU, enforcement of the LUCs, and 5-year reviews.

B5.0 REFERENCES

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TABLES

TABLE B-1: SUMMARY OF ESTIMATED COSTS

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Alternative Description	Total Project Duration (Years)	Capital Cost (Base Year Cost)	Future Value Annual O&M Cost	Future Value Total Periodic Cost (2)	Total Present Value Cost (Over 30 Years) (1)
Alternative 1: No Action	0	$0	$0	$0	$0
Alternative 2: Land Use Controls	30	$191,000	$0	$123,000 (4)	$659,000
Alternative 3: Excavation and Off-Site Disposal (Arsenic Concentrations above 39 mg/kg)	1	$226,000	$0	$1,332,000 (3)	$1,531,000
Alternative 3: Excavation and Off-Site Disposal (Arsenic Concentrations above 22 mg/kg)	1	$256,000	$0	$1,509,000 (3)	$1,734,000
Alternative 4: Excavation, Containment, and Land Use Controls (Arsenic Concentrations above 39 mg/kg)	30	$406,000	$26,000	$820,000 (3) $168,000 (4)	$2,251,000
Alternative 4: Excavation, Containment, and Land Use Controls (Arsenic Concentrations above 22 mg/kg)	30	$425,000	$26,000	$911,000 (3) $168,000 (4)	$2,361,000

Notes:

1 Total present value costs for each alternative using an annual discount factor of 2.1 percent for a 3-year duration and 2.8 percent for a 30-year duration are shown in Tables B-2 through B-4B. Itemized costs for each alternative are shown in Tables B-5 through B-7B.

2 Periodic costs are incurred every 5 years unless otherwise noted.

3 Year 1 only.

4 Every 5 years.

mg/kg Milligrams per kilogram

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TABLE B-2: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 2, LAND USE CONTROLS

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor at 2.80%

Year	Future Value of Costs for Alternative 2	Annual Discount Factor[1]	Present Value Cost for Alternative 2	Present Value Cost for Alternative 2
0	$191,343	1	Land Use Control Planning Documents and Implementation	$191,343
5	$123,055	0.871	5-Year Review	$107,185
10	$123,055	0.759	5-Year Review	$93,361
15	$123,055	0.661	5-Year Review	$81,321
20	$123,055	0.576	5-Year Review	$70,833
25	$123,055	0.501	5-Year Review	$61,698
30	$123,055	0.437	5-Year Review	$53,741
			Total Present Value Cost Over 30 Years	**$659,482**

Notes:

1 Annual discount factor = $1/(1+i)^t$, where i=0.028 and t=year (that is, the present value of $1 paid in year t at 2.80%). Annual discount rate obtained from OMB Circluar No. A-94, 2008.

TABLE B-3A: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 3, EXCAVATION AND OFF-SITE DISPOSAL (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor at 2.10%

Year	Future Value of O&M and Periodic Cost for Alternative 3	Annual Discount Factor[1]	Present Value Cost for Alternative 3	Present Value Cost for Alternative 3
0	$225,961	1	Remedial Design and Planning Documents	$225,961
1	$1,332,040	0.979	Excavation and Off-Site Disposal	$1,304,643
			Total Present Value Cost Over 30 Years	**$1,530,604**

Notes:

1 Annual discount factor = $1/(1+i)^t$, where i=0.021 and t=year (that is, the present value of $1 paid in year t at 2.01%). Annual discount rate obtained from OMB Circluar No. A-94, 2008.

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TABLE B-3B: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 3, EXCAVATION AND OFF-SITE DISPOSAL (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor at 2.10%

Year	Future Value of O&M and Periodic Cost for Alternative 3B	Annual Discount Factor[1]	Present Value Cost for Alternative 3	Present Value Cost for Alternative 3
0	$255,947	1	Remedial Design and Planning Documents	$255,947
1	$1,508,808	0.979	Excavation and Off-Site Disposal	$1,477,775
			Total Present Value Cost Over 30 Years	**$1,733,722**

Notes:

1 Annual discount factor = $1/(1+i)^t$, where i=0.021 and t=year (that is, the present value of $1 paid in year t at 2.10%). Annual discount rate obtained from OMB Circluar No. A-94, 2008.

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TABLE B-4A: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 4, EXCAVATION, CONTAINMENT, AND LAND USE CONTROLS (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor for Year 1 Only at 2.10%
Annual Discount Factor for Years 2 through 30 at 2.80%

Year	Future Value of O&M and Periodic Cost for Alternative 4	Annual Discount Factor[1]	Present Value Cost for Alternative 4	Present Value Cost for Alternative 4
0	$405,743	1	Remedial Design, Planning Documents, and LUCs	$405,743
1	$819,769	0.979	Excavation, Containment Unit Construction, Groundwater Monitc	$802,908
2	$26,423	0.946	Site Inspection and Maintenance of Containment Unit	$25,003
3	$26,423	0.920	Site Inspection and Maintenance of Containment Unit	$24,322
4	$26,423	0.895	Site Inspection and Maintenance of Containment Unit	$23,660
5	$167,510	0.871	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$145,907
6	$26,423	0.847	Site Inspection and Maintenance of Containment Unit	$22,388
7	$26,423	0.824	Site Inspection and Maintenance of Containment Unit	$21,778
8	$26,423	0.802	Site Inspection and Maintenance of Containment Unit	$21,185
9	$26,423	0.780	Site Inspection and Maintenance of Containment Unit	$20,608
10	$167,510	0.759	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$127,089
11	$26,423	0.738	Site Inspection and Maintenance of Containment Unit	$19,501
12	$26,423	0.718	Site Inspection and Maintenance of Containment Unit	$18,970
13	$26,423	0.698	Site Inspection and Maintenance of Containment Unit	$18,453
14	$26,423	0.679	Site Inspection and Maintenance of Containment Unit	$17,950
15	$167,510	0.661	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$110,699
16	$26,423	0.643	Site Inspection and Maintenance of Containment Unit	$16,986
17	$26,423	0.625	Site Inspection and Maintenance of Containment Unit	$16,523
18	$26,423	0.608	Site Inspection and Maintenance of Containment Unit	$16,073
19	$26,423	0.592	Site Inspection and Maintenance of Containment Unit	$15,635
20	$167,510	0.576	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$96,423
21	$26,423	0.560	Site Inspection and Maintenance of Containment Unit	$14,795
22	$26,423	0.545	Site Inspection and Maintenance of Containment Unit	$14,392
23	$26,423	0.530	Site Inspection and Maintenance of Containment Unit	$14,000
24	$26,423	0.515	Site Inspection and Maintenance of Containment Unit	$13,619
25	$167,510	0.501	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$83,987
26	$26,423	0.488	Site Inspection and Maintenance of Containment Unit	$12,887
27	$26,423	0.474	Site Inspection and Maintenance of Containment Unit	$12,536
28	$26,423	0.462	Site Inspection and Maintenance of Containment Unit	$12,195
29	$26,423	0.449	Site Inspection and Maintenance of Containment Unit	$11,863
30	$167,510	0.437	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$73,156
			Total Present Value Cost Over 30 Years	**$2,251,236**

Notes:

1 Annual discount factor = 1/(1+i)t, where i=0.021 or 0.028 and t=year (that is, the present value of $1 paid in year t at 2.01% or 2.08%). Annual discount rates obtained from OMB Circluar No. A-94, 2008.

O&M Operation and maintenance

TABLE B-4B: PRESENT VALUE COST ESTIMATE FOR ALTERNATIVE 4 EXCAVATION, CONTAINMENT, AND LAND USE CONTROLS (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)

Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Annual Discount Factor for Year 1 Only at 2.10%
Annual Discount Factor for Years 2 through 30 at 2.80%

Year	Future Value of O&M and Periodic Cost for Alternative 4	Annual Discount Factor[1]	Present Value Cost for Alternative 4	Present Value Cost for Alternative 4
0	$425,187	1	Remedial Design, Planning Documents, and LUCs	$425,187
1	$911,463	0.979	:cavation, Containment Unit Construction, Groundwater Monitc	$892,716
2	$26,432	0.946	Site Inspection and Maintenance of Containment Unit	$25,011
3	$26,432	0.920	Site Inspection and Maintenance of Containment Unit	$24,330
4	$26,432	0.895	Site Inspection and Maintenance of Containment Unit	$23,667
5	$167,519	0.871	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$145,914
6	$26,432	0.847	Site Inspection and Maintenance of Containment Unit	$22,396
7	$26,432	0.824	Site Inspection and Maintenance of Containment Unit	$21,786
8	$26,432	0.802	Site Inspection and Maintenance of Containment Unit	$21,192
9	$26,432	0.780	Site Inspection and Maintenance of Containment Unit	$20,615
10	$167,519	0.759	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$127,096
11	$26,432	0.738	Site Inspection and Maintenance of Containment Unit	$19,507
12	$26,432	0.718	Site Inspection and Maintenance of Containment Unit	$18,976
13	$26,432	0.698	Site Inspection and Maintenance of Containment Unit	$18,459
14	$26,432	0.679	Site Inspection and Maintenance of Containment Unit	$17,956
15	$167,519	0.661	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$110,705
16	$26,432	0.643	Site Inspection and Maintenance of Containment Unit	$16,992
17	$26,432	0.625	Site Inspection and Maintenance of Containment Unit	$16,529
18	$26,432	0.608	Site Inspection and Maintenance of Containment Unit	$16,079
19	$26,432	0.592	Site Inspection and Maintenance of Containment Unit	$15,641
20	$167,519	0.576	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$96,428
21	$26,432	0.560	Site Inspection and Maintenance of Containment Unit	$14,800
22	$26,432	0.545	Site Inspection and Maintenance of Containment Unit	$14,397
23	$26,432	0.530	Site Inspection and Maintenance of Containment Unit	$14,005
24	$26,432	0.515	Site Inspection and Maintenance of Containment Unit	$13,624
25	$167,519	0.501	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$83,992
26	$26,432	0.488	Site Inspection and Maintenance of Containment Unit	$12,892
27	$26,432	0.474	Site Inspection and Maintenance of Containment Unit	$12,540
28	$26,432	0.462	Site Inspection and Maintenance of Containment Unit	$12,199
29	$26,432	0.449	Site Inspection and Maintenance of Containment Unit	$11,867
30	$167,519	0.437	5-Year Review, Contain. Unit O&M, Groundwater Monitoring	$73,159
			Total Present Value Cost Over 30 Years	**$2,360,658**

Notes:

1 Annual discount factor = 1/(1+i)t, where i=0.021 or 0.028 and t=year (that is, the present value of $1 paid in year t at 2.01% or 2.08%). Annual discount rates obtained from OMB Circluar No. A-94, 2008.

O&M Operation and maintenance

TABLE B-5: COST DETAILS, ALTERNATIVE 2
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A
Alternative 2: Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: **1.352**

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
LAND USE CONTROLS								
Planning Docs								
33220102	Project Manager	60.0	HR	0.00	225.13	0.00	225.13	$13,508
33220105	Project Engineer	60.0	HR	0.00	184.63	0.00	184.63	$11,078
33220106	Staff Engineer	130.0	HR	0.00	145.20	0.00	145.20	$18,876
33220110	QA/QC Officer	40.0	HR	0.00	180.87	0.00	180.87	$7,235
33220114	Word Processing/Clerical	40.0	HR	0.00	93.82	0.00	93.82	$3,753
33220115	Draftsman/CADD	80.0	HR	0.00	115.90	0.00	115.90	$9,272
33220503	Attorney, Partner, Real Estate	30.0	HR	0.00	248.66	0.00	248.66	$7,460
33240101	Other Direct Costs	1.0	LS	3,848.05	0.00	0.00	3,848.05	$3,848
Planning Meetings								
33010202	Per Diem (per person)	3.0	DAY	158.00	0.00	0.00	158.00	$474
33220102	Project Manager	40.0	HR	0.00	225.13	0.00	225.13	$9,005
33220114	Word Processing/Clerical	20.0	HR	0.00	93.82	0.00	93.82	$1,876
33220115	Draftsman/CADD	24.0	HR	0.00	115.90	0.00	115.90	$2,782
33240101	Other Direct Costs	1.0	LS	798.89	0.00	0.00	798.89	$799
Implementation								
33022037	Overnight Delivery, 8 oz Letter	8.0	EA		0.00	20.66	0.00	$165
33220102	Project Manager	60.0	HR	0.00	225.13	0.00	225.13	$13,508
33220105	Project Engineer	60.0	HR	0.00	184.63	0.00	184.63	$11,078
33220106	Staff Engineer	160.0	HR	0.00	145.20	0.00	145.20	$23,232
33220110	QA/QC Officer	40.0	HR	0.00	180.87	0.00	180.87	$7,235
33220114	Word Processing/Clerical	40.0	HR	0.00	93.82	0.00	93.82	$3,753
33220115	Draftsman/CADD	120.0	HR	0.00	115.90	0.00	115.90	$13,908
33220120	Computer Data Entry	100.0	HR	0.00	84.23	0.00	84.23	$8,423
33240101	Other Direct Costs	1.0	LS	1,557.62	0.00	0.00	1,557.62	$1,558
33990111	Local Fees	1.0	LS	299.70	0.00	0.00	299.70	$300
99041201	Surveying - 2-man Crew	3.0	DAY	0.00	951.99	28.04	0.00	$2,940
99041205	Portable GPS Set with Mapping, 5 cm Accuracy	1.0	MO	1418.18	0.00	0.00	1,418.18	$1,418
							Subtotal Land Use Controls - Base Year	**$191,343**

TABLE B-5: COST DETAILS, ALTERNATIVE 2
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A
Alternative 2: Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: **1.352**

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Five-Year Review								
Document Review								
33220102	Project Manager	30.0	HR	0.00	274.55	0.00	274.55	$8,237
33220105	Project Engineer	30.0	HR	0.00	225.16	0.00	225.16	$6,755
33220108	Project Scientist	48.0	HR	0.00	237.62	0.00	237.62	$11,406
33220109	Staff Scientist	48.0	HR	0.00	154.35	0.00	154.35	$7,409
Interviews								
33220102	Project Manager	24.0	HR	0.00	274.55	0.00	274.55	$6,589
Site Inspection								
33220102	Project Manager	16.0	HR	0.00	274.55	0.00	274.55	$4,393
33220105	Project Engineer	16.0	HR	0.00	225.16	0.00	225.16	$3,603
33220108	Project Scientist	24.0	HR	0.00	237.62	0.00	237.62	$5,703
33220109	Staff Scientist	24.0	HR	0.00	154.35	0.00	154.35	$3,704
Report								
33220102	Project Manager	50.0	HR	0.00	274.55	0.00	274.55	$13,728
33220105	Project Engineer	50.0	HR	0.00	225.16	0.00	225.16	$11,258
33220108	Project Scientist	80.0	HR	0.00	237.62	0.00	237.62	$19,010
33220109	Staff Scientist	80.0	HR	0.00	154.35	0.00	154.35	$12,348
							Subtotal - Every Five Years:	**$123,055**
							Subtotal - Thirty Years:	**$738,329**
							SUBTOTAL LAND USE CONTROLS:	**$929,672**
ESCALATION FACTOR[1]								**1.078**
SUMMARY							**Base Costs:**	**$191,343**
							Periodic Costs:	**$738,329**
							TOTAL ALTERNATIVE 2:	**$929,672**

Note: All unit costs are from the RACER 2009 database, which uses 2006 dollars. Hours and quantities are based on previous and similar work by ChaduxTt JV.

1 The Escalation Factor for 2006 is 927.56. The multiplier to adjust 2006 costs to 2010 dollars is 1.078, which is calculated 1 /(927.56 /1000). This factor equates to 7.8% inflation over the past 4 years.

TABLE B-6A: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
EXCAVATION AND DISPOSAL OF ARSENIC-CONTAMINATED SURFACE SOIL								
Excavation								
17030203	Soil excavated with scraper (excavate surface soil with scraper around magazines, does not included hauling costs - 17030282)	189	BCY	0.00	6.62	6.76	13.38	$2,527
18050402	Seeding, vegetative cover	5.7	ACRE	1391.63	995.68	362.21	2,749.52	$15,717
17030276	Excavate and load, bank measure, medium material, 3/4 C.Y bucket, hydraulic excavator (soil scraped off magazines with excavator; includes hauling costs)	4,611	BCY	0.00	5.78	1.91	7.69	$35,459
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes delivery, spreading, and compaction (Loose, include bulking factor of 1.3, no backfill on magazines)	246	CY	12.76	1.84	1.68	16.28	$3,998
							Subtotal Excavation:	**$62,208**
Pre-Excavation Biological Assessment								
	Biological Assessment for Site 22A	1	EA		60000		60,000.00	$60,000
							Subtotal Pre-Excavation Biological Assessment	**$64,686**
Salamander Protection[2]								
	Fencing and Traps	5,400	LF	6				$32,400
	Trapping (permitted biologist)	280	HR		105			$29,400
	Trapping (technician)	770	HR		80			$61,600
	Reports-Trapping Plan	1	EA	5000				$5,000
	Reports-Monthly	3	EA	1000				$3,000
	Reports-Final	1	EA	1500				$1,500
	Const. Oversight (permitted biologist)	320	HR		105			$33,600
							Subtotal Salamander Protection:	**$179,503**
Confirmation Sampling and Waste Disposal Characterization								
33020603	Surface Soil Sampling Equipment	115	EA	30.00	0.00	0.00	30.00	$3,459
33021705	Targeted TCLP (metals, volatiles, semi-volatiles only), Soil analysis	4	EA	935.19	0.00	0.00	935.19	$3,851
	California WET analysis, assume same price as TCLP	4	EA	935.19	0.00	0.00	935.19	$3,851
33021711	Testing, arsenic EPA 7060	115	EA	33.50	0.00	0.00	33.50	$3,862
33220112	Field Technician	58	HR	0.00	116.92	0.00	116.92	$6,740
33220119	Health and Safety Officer	6	HR	0.00	180.36	0.00	180.36	$1,040
							Subtotal Confirmation Sampling:	**$24,585**
Load and Haul - Transportation and Disposal								
	Transportation & Disposal	9,360	TON	36.00	0.00	0.00	36.00	$336,960
17030226	988, 7.0 CY, Wheel Loader	33	HR	0.00	118.91	278.32	397.23	$13,279
	Encroachment Permit	1	EA	5000.00				$5,000
	Bond/Road Repair	1	EA	100000.00				$100,000
							Subtotal Load and Haul:	**$490,792**

TABLE B-6A: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Clear and Grub								
17010101	Selective clearing, brush, light clearing, with dozer and brush rake, excludes removal offsite	6	ACRE	0.00	172.75	168.68	341.43	$1,952
							Subtotal Clear and Grub:	**$2,104**
Decontamination Facilities								
19040602	Storage Tanks, steel, above ground, single wall, 550 gallon, incl. cradles, coating & fittings, excl. foundation, pumps or piping	1	EA	3241.56	759.29	0.00	4,000.85	$4,001
33080503	Polymeric Liner Anchor Trench, 3' x 1.5'	89	LF	0.07	3.73	0.65	4.45	$395
33080532	8 oz/sy Erosion Control/Drainage Filter Fabric (80 Mil)	40	SY	1.52	1.57	0.05	3.14	$126
33080571	Secure burial cell construction, polymeric liner and cover system, rough textured H.D. polyethylene (HDPE), 40 mil	360	SF	0.71	0.39	0.03	1.13	$407
33170818	Spray washers, cold water, electric, 1800 psi, 5 GPM, 5 HP	1	MO	1661.30	0.00	0.00	1,661.30	$1,661
33170823	Operation of Pressure Washer, Including Water, Soap, Electricity, Labor	40	HR	56.32	127.01	0.00	183.33	$7,333
33170825	Railroad siding, wood tie, pressure treated, C.L. lots, 6" x 8" x 8'-6" L	9	EA	75.97	56.46	3.04	135.47	$1,219
33230512	1" Submersible Pump Rental	1	MO	1444.11	0.00	0.00	1,444.11	$1,444
33260623	(2 1/2", 4") PVC Double-wall Piping, with Fittings	30	LF	59.26	59.56	0.00	118.82	$3,565
							Subtotal Decontamination Facility	**$21,725**

TABLE B-6A: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Residual Waste Management - Decon Waste and Misc.								
33190101	Liquid Loading Into 5,000 Gallon Bulk Tank Truck	10	EA	0.00	915.99	589.15	1,505.14	$15,051
33190103	Load Drums on Disposal Vehicle	8	EA	0.00	10.43	2.95	13.38	$107
33190204	Transport 55 Gallon Drums of Hazardous Waste, Max 80 drums (per Mile)	500	MI	2.95	0.00	0.00	2.95	$1,475
33190207	Transport Bulk Liquid/Sludge Hazardous Waste, Maximum 5,000 Gallon (per Mile)	500	MI	2.95	0.00	0.00	2.95	$1,475
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.0	EA	745.56	0.00	0.00	745.56	$746
33197205	Landfill Nonhazardous Solid Waste, 55 Gallon Drum	10	EA	215.56	0.00	0.00	215.56	$2,156
33197278	Commercial RCRA landfills, liquid/sludge, non-fuel, non-hazardous	10,000	GAL	4.34	0.00	0.00	4.34	$43,400
							Subtotal Residual Waste Management:	**$69,440**
Bulk Material Storage (Stockpile)								
17030102	Rough Grading, 12G, 1 Pass	6,084	SY	0.00	0.40	0.28	0.68	$4,137
17030105	Fine Grading, Hand	1,432	SY	0.00	5.82	0.00	5.82	$8,334
17030106	Fine Grading, 12G, 2 Passes	6,084	SY	0.00	0.91	0.65	1.56	$9,491
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	521	CY	12.76	1.84	1.68	16.28	$8,482
17030430	Gravel, 6" Lifts	1,778	CY	35.45	14.41	1.59	51.45	$91,478
33080563	Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 ml	48,002	SF	0.81	0.73	0.07	1.61	$77,283
							Subtotal Stockpile:	**$214,763**
							SUBTOTAL EXCAVATION AND DISPOSAL	**$1,129,805**

TABLE B-6A: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by:	**Date:**	**Checked by:**	**Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Professional Labor Management[3]								
						Total Capital (excluding professional management costs)	**%**	**Design**
						$1,129,805	17.9	$202,235
						SUBTOTAL PROFESSIONAL LABOR MANAGEMENT		**$202,235**
REMEDIAL DESIGN[4]								
						Total Capital (excluding professional management costs)	**%**	**Design**
						$1,129,805	20.0	$225,961
							SUBTOTAL DESIGN:	**$225,961**
ESCALATION FACTOR[5]								
								1.078
SUMMARY							**Base Year Costs:**	**$1,558,002**
							O&M:	**$0**
							TOTAL ALTERNATIVE 3:	**$1,558,002**

Note: All unit costs are from the RACER 2009 database, which uses 2006 dollars, with the exception of the landfill disposal chages.

1 The unit cost for nonhazardous waste disposal and transportation to Altamont Landfill.
2 The cost for salamander protection are estimated costs provided by Condor County Consulting.
3 Professional labor costs were calculated using the default percentage of 17.9 % assigned by RACER multiplied by the total capital costs.
4 Remedial design percentage was chosen based on experience and professional judgment.
5 The Escalation Factor for 2006 is 927.56. The multiplier to adjust 2006 costs to 2010 dollars is 1.078, which is calculated 1 /(927.56 /1000).
This factor equates to 7.8% inflation over the past 4 years.

TABLE B-6B: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
EXCAVATION AND DISPOSAL OF ARSENIC-CONTAMINATED SURFACE SOIL								
Excavation								
17030203	Soil excavated with scraper (excavate surface soil with scraper around magazines, does not included hauling costs - 17030282)	204	BCY	0.00	6.62	6.76	13.38	$2,726
18050402	Seeding, vegetative cover	7.4	ACRE	1391.63	995.68	362.21	2,749.52	$20,438
17030276	Excavate and load, bank measure, medium material, 3/4 C.Y bucket, hydraulic excavator (soil scraped off magazines with excavator; includes hauling costs)	5,996	BCY	0.00	5.78	1.91	7.69	$46,112
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes delivery, spreading, and compaction (Loose, include bulking factor of 1.3, no backfill on magazines)	265	CY	12.76	1.84	1.68	16.28	$4,311
							Subtotal Excavation:	**$79,334**
Pre-Excavation Biological Assessment								
	Biological Assessment for Site 22A	1	EA		60000		60,000.00	$60,000
							Subtotal Pre-Excavation Biological Assessment	**$64,686**
Salamander Protection[2]								
	Fencing and Traps	7,440	LF	6				$44,640
	Trapping (permitted biologist)	280	HR		105			$29,400
	Trapping (technician)	770	HR		80			$61,600
	Reports-Trapping Plan	1	EA	5000				$5,000
	Reports-Monthly	3	EA	1000				$3,000
	Reports-Final	1	EA	1500				$1,500
	Const. Oversight (permitted biologist)	320	HR		105			$33,600
							Subtotal Salamander Protection:	**$192,699**
Confirmation Sampling and Waste Disposal Characterization								
33020603	Surface Soil Sampling Equipment	161	EA	30.00	0.00	0.00	30.00	$4,824
33021705	Targeted TCLP (metals, volatiles, semi-volatiles only), Soil analysis	5	EA	935.19	0.00	0.00	935.19	$4,975
	California WET analysis, assume same price as TCLP	5	EA	935.19	0.00	0.00	935.19	$4,975
33021711	Testing, arsenic EPA 7060	161	EA	33.50	0.00	0.00	33.50	$5,386
33220112	Field Technician	80	HR	0.00	116.92	0.00	116.92	$9,400
33220119	Health and Safety Officer	8	HR	0.00	180.36	0.00	180.36	$1,450
							Subtotal Confirmation Sampling:	**$33,431**
Load and Haul - Transportation and Disposal								
	Transportation & Disposal[1]	12,090	TON	36.00	0.00	0.00	36.00	$435,240
17030226	988, 7.0 CY, Wheel Loader	43	HR	0.00	118.91	278.32	397.23	$17,152
	Encroachment Permit	1	EA	5000.00				$5,000
	Bond/Road Repair	1	EA	100000.00				$100,000
							Subtotal Load and Haul:	**$600,923**

TABLE B-6B: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Clear and Grub								
17010101	Selective clearing, brush, light clearing, with dozer and brush rake, excludes removal offsite	7	ACRE	0.00	172.75	168.68	341.43	$2,538
							Subtotal Clear and Grub:	**$2,736**
Decontamination Facilities								
19040602	Storage Tanks, steel, above ground, single wall, 550 gallon, incl. cradles, coating & fittings, excl. foundation, pumps or piping	1	EA	3241.56	759.29	0.00	4,000.85	$4,001
33080503	Polymeric Liner Anchor Trench, 3' x 1.5'	89	LF	0.07	3.73	0.65	4.45	$395
33080532	8 oz/sy Erosion Control/Drainage Filter Fabric (80 Mil)	40	SY	1.52	1.57	0.05	3.14	$126
33080571	Secure burial cell construction, polymeric liner and cover system, rough textured H.D. polyethylene (HDPE), 40 mil	360	SF	0.71	0.39	0.03	1.13	$407
33170818	Spray washers, cold water, electric, 1800 psi, 5 GPM, 5 HP	1	MO	1661.30	0.00	0.00	1,661.30	$1,661
33170823	Operation of Pressure Washer, Including Water, Soap, Electricity, Labor	40	HR	56.32	127.01	0.00	183.33	$7,333
33170825	Railroad siding, wood tie, pressure treated, C.L. lots, 6" x 8" x 8'-6" L	9	EA	75.97	56.46	3.04	135.47	$1,219
33230512	1" Submersible Pump Rental	1	MO	1444.11	0.00	0.00	1,444.11	$1,444
33260623	(2 1/2", 4") PVC Double-wall Piping, with Fittings	30	LF	59.26	59.56	0.00	118.82	$3,565
							Subtotal Decontamination Facility	**$21,725**

TABLE B-6B: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Residual Waste Management - Decon Waste and Misc.								
33190101	Liquid Loading Into 5,000 Gallon Bulk Tank Truck	10	EA	0.00	915.99	589.15	1,505.14	$15,051
33190103	Load Drums on Disposal Vehicle	8	EA	0.00	10.43	2.95	13.38	$107
33190204	Transport 55 Gallon Drums of Hazardous Waste, Max 80 drums (per Mile)	500	MI	2.95	0.00	0.00	2.95	$1,475
33190207	Transport Bulk Liquid/Sludge Hazardous Waste, Maximum 5,000 Gallon (per Mile)	500	MI	2.95	0.00	0.00	2.95	$1,475
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.0	EA	745.56	0.00	0.00	745.56	$746
33197205	Landfill Nonhazardous Solid Waste, 55 Gallon Drum	10	EA	215.56	0.00	0.00	215.56	$2,156
33197278	Commercial RCRA landfills, liquid/sludge, non-fuel, non-hazardous	10,000	GAL	4.34	0.00	0.00	4.34	$43,400
							Subtotal Residual Waste Management:	**$69,440**
Bulk Material Storage (Stockpile)								
17030102	Rough Grading, 12G, 1 Pass	6,084	SY	0.00	0.40	0.28	0.68	$4,137
17030105	Fine Grading, Hand	1,432	SY	0.00	5.82	0.00	5.82	$8,334
17030106	Fine Grading, 12G, 2 Passes	6,084	SY	0.00	0.91	0.65	1.56	$9,491
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	521	CY	12.76	1.84	1.68	16.28	$8,482
17030430	Gravel, 6" Lifts	1,778	CY	35.45	14.41	1.59	51.45	$91,478
33080563	Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 ml	48,002	SF	0.81	0.73	0.07	1.61	$77,283
							Subtotal Stockpile:	**$214,763**
							SUBTOTAL EXCAVATION AND DISPOSAL	**$1,279,736**

TABLE B-6B: COST DETAILS, ALTERNATIVE 3 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Seal Beach Detachment Concord, IR Site 22A**
Alternative 3: Excavation and Off-Site Disposa

Prepared by:	**Date:**	**Checked by:**	**Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Professional Labor Management[3]								
						Total Capital (excluding professional management costs)	**%**	**Design**
						$1,279,736	17.9	$229,073
						SUBTOTAL PROFESSIONAL LABOR MANAGEMENT		**$229,073**
REMEDIAL DESIGN[4]								
						Total Capital (excluding professional management costs)	**%**	**Design**
						$1,279,736	20.0	$255,947
							SUBTOTAL DESIGN:	**$255,947**
ESCALATION FACTOR[5]								
								1.078
SUMMARY							**Base Year Costs:**	**$1,764,755**
							O&M:	**$0**
							TOTAL ALTERNATIVE 3:	**$1,764,755**

Note: All unit costs are from the RACER 2009 database, which uses 2006 dollars, with the exception of the landfill disposal chages.

1 The unit cost for nonhazardous waste disposal and transportation to Altamont Landfill.
2 The cost for salamander protection are estimated costs provided by Condor County Consulting.
3 Professional labor costs were calculated using the default percentage of 17.9 % assigned by RACER multiplied by the total capital costs.
4 Remedial design percentage was chosen based on experience and professional judgment.
5 The Escalation Factor for 2006 is 927.56. The multiplier to adjust 2006 costs to 2010 dollars is 1.078, which is calculated 1 /(927.56 /1000). $6,626,484
This factor equates to 7.8% inflation over the past 4 years. 0.266

TABLE B-7A: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Excavation of Arsenic-Contaminated Soil								
17030203	Soil excavated with scraper (excavate surface soil with scraper, includes hauling to CAMU area)	189	BCY	0.00	6.62	6.76	13.38	$2,527
17030276	Excavate and load, bank measure, medium material, 3/4 C.Y bucket, hydraulic excavator (scrape soil off magazines)	4,611	BCY	0.00	5.78	1.91	7.69	$35,459
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes delivery, spreading, and compaction (loose, include bulking factor of 1.3, no backfill on magazines, does not include CAMU area)	246	CY	12.76	1.84	1.68	16.28	$3,998
18050402	Seeding, vegetative cover	6	ACRE	1391.63	995.68	362.21	2,749.52	$15,717
							Subtotal Excavation:	**$62,208**
Pre-Excavation Biological Assessment								
	Biological Assessment for Site 22A	1	EA		60000.00		60,000.00	$60,000
							Subtotal Pre-Excavation Biological Assessment	**$64,686**
Salamander Protection[2]								
	Fencing and traps	5,400	LF	6				$32,400
	Trapping (permitted biologist)	280	HR		105.00			$29,400
	Trapping (technicians)	770	HR		80.00			$61,600
	Reports-Trapping Plan	1	EA	5,000				$5,000
	Reports-Monthly	3	EA	1,000				$3,000
	Reports-Final	1	EA	1,500				$1,500
	Const. Oversight (permitted biologist)	480	HR		105.00			$50,400
							Subtotal Salamander Protection:	**$197,615**
Confirmation Sampling								
33020603	Surface Soil Sampling Equipment	115	EA	30.00	0.00	0.00	30.00	$3,459
33021711	Testing, arsenic EPA 7060	115	EA	33.50	0.00	0.00	33.50	$3,862
33220112	Field Technician	58	HR	0.00	116.92	0.00	116.92	$6,740
33220119	Health and Safety Officer	23	HR	0.00	180.36	0.00	180.36	$4,159
							Subtotal Confirmation Sampling:	**$19,644**
Clear and Grub								
	Same as Alternative 3, see Table B-6.						**Subtotal Clear and Grub:**	**$2,104**
Decontamination Facilities								
	Same as Alternative 3, see Table B-6.						**Subtotal Decontamination Facility**	**$21,725**
Residual Waste Management - Decon Waste and Misc.								
	Same as Alternative 3, see Table B-6.						**Subtotal Residual Waste Management:**	**$69,440**
							SUBTOTAL EXCAVATION:	**$437,421**

TABLE B-7A: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
CONTAINMENT UNIT								
Cover Containment Unit								
17010101	Selective clearing, brush, light clearing, with dozer and brush rake, excludes removal offsite	1.0	ACRE	0.00	172.75	168.68	341.43	$341
17030282	Hauling, soil, 12 CY truck, 5 mile haul, includes loading	6,240	CY	8.78	3.80	2.54	15.12	$94,349
17030424	Unclassified Fill, 6" Lifts, Off-Site, Includes delivery, spreading, and compaction (0.5 feet of clean material on CAMU, includes bulking factor of 1.3)	1,049	CY	12.36	0.00	0.00	5.72	$12,962
18050402	Seeding, vegetative cover	5.7	ACRE	1,391.63	995.68	362.21	2,749.52	$15,717
							Subtotal Cover Containment Unit:	**$133,003**
Install Groundwater Monitoring Wells (5 wells)								
33020303	Organic Vapor Analyzer Rental	7	DAY	57.11	0.00	0.00	57.11	$400
33021102	Testing, moisture content (209a)	10	EA	39.71	0.00	0.00	39.71	$397
33021709	Testing, TAL metals (6010/7000s)	10	EA	469.49	0.00	0.00	469.49	$4,695
33170808	Decontaminate Rig, Augers, Screen	7	DAY	36.06	1016.09	0.00	1,052.15	$7,365
33220112	Field Technician	40	HR	0.00	116.92	0.00	116.92	$4,677
33230101	2" PVC, Schedule 40, Well Casing	150	LF	2.35	8.42	7.75	18.52	$2,778
33230201	2" PVC, Schedule 40, Well Screen	60	LF	4.27	8.42	7.75	20.44	$1,226
33230301	2" PVC, Well Plug	5	EA	19.35	25.27	23.25	67.87	$339
33231101	Hollow Stem Auger, 8" Dia Borehole, Depth <= 100 ft	170	LF	0.00	28.63	35.11	63.74	$10,836
33231173	Split Spoon Sampling	50	LF	0.00	22.51	8.79	31.30	$1,565
33231182	DOT steel drums, 55 gal., open, 17C	9	EA	192.47	0.00	0.00	192.47	$1,732
33231401	2" Screen, Filter Pack	70	LF	14.39	6.50	5.98	26.87	$1,881
3323181	2" Well, Portland Cement Grout	120	LF	2.00	0.00	0.00	2.00	$240
33232101	2" Well, Bentonite Seal	5	EA	206.65	168.03	154.61	529.29	$2,646
33010101	Mobilize/DeMobilize Drilling Rig & Crew	1	LS	0.00	2,527.19	1,140.51	3,667.70	$3,668
33231178	Move Rig/Equipment Around Site	4	EA	135.13	363.28	163.95	662.36	$2,649
33231504	Surface Pad, Concrete, 2' x 2' x 4"	5	EA	73.55	33.64	5.21	112.40	$562
							Subtotal Install Groundwater Monitoring Wells	**$51,379**
							SUBTOTAL CONTAINMENT UNIT:	**$184,382**
MAINTENANCE - CONTAINMENT UNIT[2]								
Site Inspection								
33220102	Project Manager	8	HR	0.00	274.55	0.00	274.55	$2,196
33220105	Project Engineer	8	HR	0.00	225.16	0.00	225.16	$1,801
33220108	Project Scientist	16	HR	0.00	237.62	0.00	237.62	$3,802
33220109	Staff Scientist	16	HR	0.00	154.35	0.00	154.35	$2,470
							Subtotal Site Inspection:	**$11,071**

TABLE B-7A: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Operation and Maintenance[3]								
17030106	Fine Grading, Hand	387	SY	0.00	5.82	0.00	5.82	$2,254
17030422	Unclassified Fill, 6" Lifts, On-Site, Includes Spreading and Compaction	7	CY	0.41	5.05	4.34	9.80	$70
18050402	Seeding, Vegetative Cover	0.01	ACRE	1,391.63	995.68	362.21	2,749.52	$27
33010202	Per Diem (per person)	4	DAY	158.00	0.00	0.00	158.00	$632
33010204	Mobilize Crew, 100 Miles, per person	2	EA	271.48	0.00	0.00	271.48	$543
33190340	Non Haz Drummed Site Waste - Load, Transp, & Landfill Disp (55-Gal Drums)	2	EA	356.57	0.00	0.00	356.57	$713
33199921	DOT steel drums, 55 gal., open, 17C	2	EA	192.47	0.00	0.00	192.47	$385
33220104	Senior Staff Engineer	16	HR	0.00	306.95	0.00	306.95	$4,911
33220106	Staff Engineer	16	HR	0.00	177.08	0.00	177.08	$2,833
33220112	Field Technician	16	HR	0.00	116.92	0.00	116.92	$1,871
							Subtotal Operation and Maintenance	**$15,352**
Groundwater Monitoring								
33020401	Disposable Materials per Sample	8.0	EA	17.25	0.00	0.00	17.25	$138
33020402	Decontamination Materials per Sample	8.0	EA	15.83	0.00	0.00	15.83	$127
33020561	Lysimeter accessories, nylong tubing 1/4" C	170.0	LF	1.09	0.00	0.00	1.09	$185
33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1.0	WK	419.78	0.00	0.00	419.78	$420
33021711	Testing, arsenic (EPA 7060) (SW5030/8020)	7.0	EA	33.50	0.00	0.00	33.50	$235
33230509	4" Submersible Pump Rental, Day	2.0	DAY	186.39	0.00	0.00	186.39	$373
33231186	Well Development Equipment Rental (weekly)	1.0	WK	978.95	0.00	0.00	978.95	$979
33010104	Sample collection, vehicle mileage charge, car or van	150.0	MI	0.59	0.00	0.00	0.59	$89
33220108	Project Scientist	40.0	HR	0.00	237.62	0.00	237.62	$9,505
33220112	Field Technician	40.0	HR	0.00	116.92	0.00	116.92	$4,677
							Subtotal Groundwater Monitoring:	**$18,032**
							Subtotal O&M - Base Year:	**$44,455**
							Subtotal O&M - Thirty Years:	**$918,910**

TABLE B-7A: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 39 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
LAND USE CONTROLS								
Administrative Tasks								
	Same as Alternative 2, see Table B-5.						**Subtotal Land Use Controls - Base Year:**	**$191,343**
Five-Year Review								
	Same as Alternative 2, see Table B-5.						**Subtotal - Every Five Years:**	**$123,055**
							Subtotal - Thirty Years:	**$738,329**
							SUBTOTAL LAND USE CONTROLS:	**$929,672**
Professional Labor Management[4]								
		Total Capital (excluding professional management costs)						
						$857,601	17.9%	$153,511
							SUBTOTAL PROFESSIONAL LABOR MANAGEMENT	**$153,511**
REMEDIAL DESIGN[5]								
		Total Capital (excluding professional management costs						
						$ 857,601	25.0%	$214,400
							SUBTOTAL DESIGN:	**$214,400**
ESCALATION FACTOR[6]								**1.078**
SUMMARY							**Base Year Costs:**	**$1,321,222**
							O&M:	**$1,612,784**
							TOTAL ALTERNATIVE 4:	**$2,934,006**

Note: All unit costs are from the RACER 2009 database, which uses 2006 dollars.

1 The cost for salamander protection are estimated costs provided by Condor Country Consulting.
2 Costs assume annual O&M and site inspections and groundwater monitoring activities every 5 years.
3 Assumed that 1% of the CAMU needs repair every year
4 Professional labor costs were calculated using the default percentage of 17.9% assigned by RACER 2009 multiplied by the total capital costs.
5 Remedial design percentage was chosen based on experience and professional judgment.
6 The Escalation Factor for 2006 is 927.56. The multiplier to adjust 2006 costs to 2010 dollars is 1.078, which is calculated 1 /(927.56 /1000).
This factor equates to 7.8% inflation over the past 4 years.

TABLE B-7B: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Excavation of Arsenic-Contaminated Soil								
17030203	Soil excavated with scraper (excavate surface soil with scraper, includes hauling to CAMU area)	204	BCY	0.00	6.62	6.76	13.38	$2,726
17030276	Excavate and load, bank measure, medium material, 3/4 C.Y bucket, hydraulic excavator (scrape soil off magazines)	5,996	BCY	0.00	5.78	1.91	7.69	$46,112
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes delivery, spreading, and compaction (loose, include bulking factor of 1.3, no backfill on magazines, does not include CAMU area)	265	CY	12.76	1.84	1.68	16.28	$4,311
18050402	Seeding, vegetative cover	7	ACRE	1391.63	995.68	362.21	2,749.52	$20,438
							Subtotal Excavation:	**$79,334**
Pre-Excavation Biological Assessment								
	Biological Assessment for Site 22A	1	EA		60000.00		60,000.00	$60,000
							Subtotal Pre-Excavation Biological Assessment	**$64,686**
Salamander Protection[2]								
	Fencing and traps	7,440	LF	6				$44,640
	Trapping (permitted biologist)	280	HR		105.00			$29,400
	Trapping (technicians)	770	HR		80.00			$61,600
	Reports-Trapping Plan	1	EA	5,000				$5,000
	Reports-Monthly	3	EA	1,000				$3,000
	Reports-Final	1	EA	1,500				$1,500
	Const. Oversight (permitted biologist)	480	HR		105.00			$50,400
							Subtotal Salamander Protection:	**$210,811**
Confirmation Sampling								
33020603	Surface Soil Sampling Equipment	161	EA	30.00	0.00	0.00	30.00	$4,824
33021711	Testing, arsenic EPA 7060	161	EA	33.50	0.00	0.00	33.50	$5,386
33220112	Field Technician	80	HR	0.00	116.92	0.00	116.92	$9,400
33220119	Health and Safety Officer	32	HR	0.00	180.36	0.00	180.36	$5,800
							Subtotal Confirmation Sampling:	**$27,394**
Clear and Grub								
	Same as Alternative 3, see Table B-6.						**Subtotal Clear and Grub:**	**$2,736**
Decontamination Facilities								
	Same as Alternative 3, see Table B-6.						**Subtotal Decontamination Facility**	**$21,725**
Residual Waste Management - Decon Waste and Misc.								
	Same as Alternative 3, see Table B-6.						**Subtotal Residual Waste Management:**	**$69,440**
							SUBTOTAL EXCAVATION:	**$476,125**

TABLE B-7B: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
CONTAINMENT UNIT								
Cover Containment Unit								
17010101	Selective clearing, brush, light clearing, with dozer and brush rake, excludes removal offsite	1.3	ACRE	0.00	172.75	168.68	341.43	$444
17030282	Hauling, soil, 12 CY truck, 5 mile haul, includes loading	8,060	CY	8.78	3.80	2.54	15.12	$121,867
17030424	Unclassified Fill, 6" Lifts, Off-Site, Includes delivery, spreading, and compaction (0.5 feet of clean material on CAMU, includes bulking factor of 1.3)	1,363	CY	12.36	0.00	0.00	7.43	$16,850
18050402	Seeding, vegetative cover	7.4	ACRE	1,391.63	995.68	362.21	2,749.52	$20,438
							Subtotal Cover Containment Unit:	**$172,064**
Install Groundwater Monitoring Wells (5 wells)								
33020303	Organic Vapor Analyzer Rental	7	DAY	57.11	0.00	0.00	57.11	$400
33021102	Testing, moisture content (209a)	10	EA	39.71	0.00	0.00	39.71	$397
33021709	Testing, TAL metals (6010/7000s)	10	EA	469.49	0.00	0.00	469.49	$4,695
33170808	Decontaminate Rig, Augers, Screen	7	DAY	36.06	1016.09	0.00	1,052.15	$7,365
33220112	Field Technician	40	HR	0.00	116.92	0.00	116.92	$4,677
33230101	2" PVC, Schedule 40, Well Casing	150	LF	2.35	8.42	7.75	18.52	$2,778
33230201	2" PVC, Schedule 40, Well Screen	60	LF	4.27	8.42	7.75	20.44	$1,226
33230301	2" PVC, Well Plug	5	EA	19.35	25.27	23.25	67.87	$339
33231101	Hollow Stem Auger, 8" Dia Borehole, Depth <= 100 ft	170	LF	0.00	28.63	35.11	63.74	$10,836
33231173	Split Spoon Sampling	50	LF	0.00	22.51	8.79	31.30	$1,565
33231182	DOT steel drums, 55 gal., open, 17C	9	EA	192.47	0.00	0.00	192.47	$1,732
33231401	2" Screen, Filter Pack	70	LF	14.39	6.50	5.98	26.87	$1,881
3323181	2" Well, Portland Cement Grout	120	LF	2.00	0.00	0.00	2.00	$240
33232101	2" Well, Bentonite Seal	5	EA	206.65	168.03	154.61	529.29	$2,646
33010101	Mobilize/DeMobilize Drilling Rig & Crew	1	LS	0.00	2,527.19	1,140.51	3,667.70	$3,668
33231178	Move Rig/Equipment Around Site	4	EA	135.13	363.28	163.95	662.36	$2,649
33231504	Surface Pad, Concrete, 2' x 2' x 4"	5	EA	73.55	33.64	5.21	112.40	$562
							Subtotal Install Groundwater Monitoring Wells	**$51,379**
							SUBTOTAL CONTAINMENT UNIT:	**$223,443**
MAINTENANCE - CONTAINMENT UNIT[2]								
Site Inspection								
33220102	Project Manager	8	HR	0.00	274.55	0.00	274.55	$2,196
33220105	Project Engineer	8	HR	0.00	225.16	0.00	225.16	$1,801
33220108	Project Scientist	16	HR	0.00	237.62	0.00	237.62	$3,802
33220109	Staff Scientist	16	HR	0.00	154.35	0.00	154.35	$2,470
							Subtotal Site Inspection:	**$11,071**

TABLE B-7B: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: **Former Naval Weapons Station Concord, Site 22A**
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Operation and Maintenance[3]								
17030106	Fine Grading, Hand	387	SY	0.00	5.82	0.00	5.82	$2,254
17030422	Unclassified Fill, 6" Lifts, On-Site, Includes Spreading and Compaction	7	CY	0.41	5.05	4.34	9.80	$70
18050402	Seeding, Vegetative Cover	0.01	ACRE	1,391.63	995.68	362.21	2,749.52	$36
33010202	Per Diem (per person)	4	DAY	158.00	0.00	0.00	158.00	$632
33010204	Mobilize Crew, 100 Miles, per person	2	EA	271.48	0.00	0.00	271.48	$543
33190340	Non Haz Drummed Site Waste - Load, Transp, & Landfill Disp (55-Gal Drums)	2	EA	356.57	0.00	0.00	356.57	$713
33199921	DOT steel drums, 55 gal., open, 17C	2	EA	192.47	0.00	0.00	192.47	$385
33220104	Senior Staff Engineer	16	HR	0.00	306.95	0.00	306.95	$4,911
33220106	Staff Engineer	16	HR	0.00	177.08	0.00	177.08	$2,833
33220112	Field Technician	16	HR	0.00	116.92	0.00	116.92	$1,871
							Subtotal Operation and Maintenance	**$15,360**
Groundwater Monitoring								
33020401	Disposable Materials per Sample	8.0	EA	17.25	0.00	0.00	17.25	$138
33020402	Decontamination Materials per Sample	8.0	EA	15.83	0.00	0.00	15.83	$127
33020561	Lysimeter accessories, nylong tubing 1/4" O	170.0	LF	1.09	0.00	0.00	1.09	$185
33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1.0	WK	419.78	0.00	0.00	419.78	$420
33021711	Testing, arsenic (EPA 7060) (SW5030/8020)	7.0	EA	33.50	0.00	0.00	33.50	$235
33230509	4" Submersible Pump Rental, Day	2.0	DAY	186.39	0.00	0.00	186.39	$373
33231186	Well Development Equipment Rental (weekly)	1.0	WK	978.95	0.00	0.00	978.95	$979
33010104	Sample collection, vehicle mileage charge, car or van	150.0	MI	0.59	0.00	0.00	0.59	$89
33220108	Project Scientist	40.0	HR	0.00	237.62	0.00	237.62	$9,505
33220112	Field Technician	40.0	HR	0.00	116.92	0.00	116.92	$4,677
							Subtotal Groundwater Monitoring:	**$18,032**
							Subtotal O&M - Base Year:	**$44,464**
							Subtotal O&M - Thirty Years:	**$919,176**
LAND USE CONTROLS								
Administrative Tasks								
	Same as Alternative 2, see Table B-5.						**Subtotal Land Use Controls - Base Year:**	**$191,343**
Five-Year Review								
	Same as Alternative 2, see Table B-5.						**Subtotal - Every Five Years:**	**$123,055**
							Subtotal - Thirty Years:	**$738,329**
							SUBTOTAL LAND USE CONTROLS:	**$929,672**

TABLE B-7B: COST DETAILS, ALTERNATIVE 4 (ARSENIC CONCENTRATIONS ABOVE 22 MG/KG)
Feasibility Study for Installation Restoration Site 22A
Former Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Project: Former Naval Weapons Station Concord, Site 22A
Alternative 4: Excavation, Containment, and Land Use Controls

Prepared by: **Date:** **Checked by:** **Date:**

RACER Database: Modified System
Cost Database Date: 2009

Location Modifier: 1.352

Assembly	Description	Quantity	Unit	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Total Loaded Unit Cost	Extended Cost
Professional Labor Management[4]								
		Total Capital (excluding professional management costs)						
						$935,374	17.9%	$167,432
						SUBTOTAL PROFESSIONAL LABOR MANAGEMENT		**$167,432**
REMEDIAL DESIGN[5]								
		Total Capital (excluding professional management costs						
						$ 935,374	25.0%	$233,844
							SUBTOTAL DESIGN:	**$233,844**
ESCALATION FACTOR[6]								**1.078**
SUMMARY							**Base Year Costs:**	**$1,336,650**
							O&M:	**$1,613,042**
							TOTAL ALTERNATIVE 4:	**$2,949,692**

Note: All unit costs are from the RACER 2009 database, which uses 2006 dollars.

1 The cost for salamander protection are estimated costs provided by Condor Country Consulting.
2 Costs assume annual O&M and site inspections and groundwater monitoring activities every 5 years.
3 Assumed that 1% of the CAMU needs repair every year
4 Professional labor costs were calculated using the default percentage of 17.9% assigned by RACER 2009 multiplied by the total capital costs.
5 Remedial design percentage was chosen based on experience and professional judgment.
6 The Escalation Factor for 2006 is 927.56. The multiplier to adjust 2006 costs to 2010 dollars is 1.078, which is calculated 1 /(927.56 /1000).
This factor equates to 7.8% inflation over the past 4 years.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record [1]
28	meeting transcript	Section 3.0	Reporter's Transcript of Public Meeting. December 5, 2012.

PROPOSED PLAN FOR IR SITE 22A
FORMER NAVAL WEAPONS STATION
SEAL BEACH DETACHMENT CONCORD

REPORTER'S TRANSCRIPT OF PUBLIC MEETING

December 5, 2012

Clyde Community Center
109 Wellington Avenue
Clyde, California

Reported by Christine M. Niccoli, RPR, C.S.R. No. 4569

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NICCOLI REPORTING
619 Pilgrim Drive
Foster City, CA 94404-1707
(650) 573-9339
CERTIFIED SHORTHAND REPORTERS SERVING THE BAY AREA
ARBITRATION * DEPOSITION * HEARING * MEETING * TRIAL

A T T E N D E E S

FACILITATOR: SCOTT D. ANDERSON, Department of the Navy
PRESENTER: VALERIE HARRIS, Department of the Navy

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CONSULTANTS, MILITARY, REGULATORS

KATIE HENRY - Tetra Tech EMI
JACQUELINE ANN LANE - U.S. Environmental Protection Agency (EPA)
TINA LOW - San Francisco Bay Water Board (Water Board)
JIM PINASCO - Department of Toxic Substances Control (DTSC)
TOMMIE JEAN VALMASSY - Tetra Tech EMI

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PUBLIC AUDIENCE

BETH BYRNE - Concord resident
HARRY BYRNE - Concord resident
BRIAN HOLT - East Bay Regional Park District
JEFF JENSEN - Concord resident
SHON WOLF - Concord RAB member

---oOo---

CLYDE, CALIFORNIA, WEDNESDAY, DECEMBER 5, 2012
6:10 P.M.
---oOo---

MR. ANDERSON: Okay. We're going to go ahead and get started. First of all, my name is Scott Anderson. I'm the BRAC environmental coordinator for the Navy here for Concord. Welcome to the Site 22 Proposed Plan public meeting for Site 22A. Sorry.

Just to let you know that we -- the meeting is being recorded. We have a court reporter here, and

that's so we have an official record of the presentation and also an official record of any public comments.

After this brief presentation, you'll be invited to come take a look at the presentation materials, the poster boards. You can ask questions to the Navy and the agencies.

And also, if you have any comments on the Proposed Plan, you can come up and give your comment to the court reporter, and they will be put into the -- to the record. Just so if you give your name and what else do you need? First and last name with your comments. Okay?

You can -- you can move ahead. Sorry.

And just so you know, Jackie Lane is here representing EPA. Jim Pinasco in the back is

3

representing DTSC, and Tina Low with the Water Board may be here. I thought she was going to be here. She may be tied up in traffic or something. So those are the regulatory agencies that are -- we have been working with on this -- on this -- the process for the -- Site 22A.

The Proposed Plan, we have a copies of the Proposed Plan in the back if you didn't get them. That was sent out the first part of November. There's a 60-day public comment period. No? Forty-five-day public comment period.

And what we try to do is have our public meeting in the -- in the middle of that comment period so if people have a chance to review the Proposed Plan before the meeting and come prepared with questions,

that's great. And if they want to come to the meeting, listen to the presentation, go back and read the Proposed Plan after the meeting and provide comments at the end of the public comment period, that's perfectly acceptable to do that. That's why we try to have the public meeting in -- kind of in the center or the middle of the comment period.

Tina Low with the Water Board just arrived. So she's -- will be here to answer any questions if need be also.

And then we, the Navy, will respond to verbal and written comments in the Record of Decision. We don't respond to comments here at this forum, but we take your comments and evaluate them, and those will be addressed in -- in the Record of Decision, or the ROD. Okay.

And so like I said before, the Proposed Plan was mailed in November, and each copy does include contact information for the Navy and the regulatory agencies. It also gives information on the admin. record and also the public -- the information repository, which is the Concord Public Library.

And the information repository has copies of all the previous reports that were conducted on Site 22A. So if you want to go back and review some of those reports that brought us to this process, those are also available for review in the information repository at the library.

And then also --

You don't need to go back.

But we do have the Web site too, our Navy BRAC PMO Web site. And there's a Concord link, and that also has information on the individual sites. Okay?

A brief overview of the presentation: I'm going to give an overview of the Navy's installation

restoration program, or IR program, as you may have hear it called. And then Valerie, who's our project manager for 22A, she will be giving the Proposed Plan summary and will be going over the different bullets that are there.

And then at the end after Valerie's presentation, then we're going to open up the room, and you can go look at the different poster boards and/or also ask any public comment per- -- for the -- for the group to go on record. Okay?

Okay. The IR program here at Concord is supported by BRAC PMO West. It's a -- It's the Program Management Office. It's part of Southwest Division, NAV- -- Naval Facilities Division, or NAVFAC.

And the purpose of the program is to identify, investigate, and then ultimately clean up any areas that have been identified as having hazardous substances and also to reduce risks to both the human health and ecological if -- if those -- if there are deemed to be risks.

And then we work under the Comprehensive Environmental Response, Compensation and Liability Act, which we have all kind of heard the acronym CERCLA. And so that is how -- what our program has to follow is the various CERCLA responsibilities and laws.

And then ultimately our ultimate goal is to move the sites towards closure and/or transfer to make sure that they are available to transfer and hopefully ultimately to site closure.

And this -- and where we are in the process, I think, for the -- for the RAB members and stuff here, you've seen this kind of flowchart before.

Initially -- it's kind of hard to see on the top -- there's preliminary assessment and site inspection, and that's the initial phase. Those are where areas are identified. A lot of that -- lot of times that's through historical document searches, interviews with past base personnel, aerial photograph reviews. Those different type of things is usually the preliminary assessment.

And if something in that preliminary assessment is deemed it needs to go -- maybe have additional investigations on, it goes into a site investi- -- not always, but it can go into a site investigation phase. That's where some preliminary investigations of the site could happen, and a site could be closed at the -- after the PA/SI stage.

At the PA/SI stage, if nothing is found, say, something -- it looked like something may be suspicious and was investigated further through the PA/SI and then

there were no issues after that, a site could be closed after the PA/SI.

If a site's deemed that additional information needs to be done, it then moves into a remedial

5 investigation, slash, feasibility study phase.
6 The remedial investigation is where we conduct
7 a further thorough investigation of the site, come up
8 with conceptual site models, do additional samplings, et
9 cetera. And that's also where we do our risk
10 assessments for human health and ecological risks.
11 And along with the remedial investigation, we
12 also conduct feasibility studies. And the feasibility
13 studies are where we evaluate different potential
14 cleanup alternatives. We don't select an alternative in
15 the feasibility study, but we do an evaluation of a
16 group of different potential alternatives. And the nine
17 CERCLA criteria are evaluated, including cost,
18 protectiveness to the environment and the human health.
19 Okay.
20 And where we are right now is in the Proposed
21 Plan stage. And the Proposed Plan is where we present
22 the proposed alternative or alternatives to the public
23 and allow for public -- of the public participation.
24 And the Proposed Plan is where the Navy presents its
25 preferred alternative, and then the public has a chance

1 to comment on that, and then those public comments are
2 then addressed ultimately in the ROD in a -- in
3 responsiveness summary in the ROD.
4 And after the ROD, a site could be closed after
5 the ROD with no further work needed to be done, or there
6 could be a remedial design remedial action recommended
7 after the ROD; and that's where we would go out and do
8 the ultimate, like, remediation, or also land-use
9 controls are also considered to be a remedial action.

And then after that, aft- -- is ultimately site closure. Okay?

And so that's the end of my talk. Valerie's going to go more into the spe- -- excuse me -- the specifics of 22A, and then we'll open it up for questions and take a look at the posters.

Thank you.

MS. HARRIS: Okay. Thanks, Scott.

PRESENTATION

BY MS. HARRIS:

My name is Valerie Harris. I'm the project manager for Site 22A at former Naval Weapons Station Seal Beach Detachment Concord. Naval Weapons Station Concord is -- well, well, it's in Contra Costa County about 30 miles northeast of San Francisco.

And tonight I'm just going to go over the main

9

components of the Proposed Plan that I think most of you received in the mail; and if not, as Scott said, it's available on the table in the back.

I'm going to talk about the background of the site, where it's located, the planned reuse for the site, the risk assessments that were performed, the feasibility study, the different alternatives that we looked at; and then I'll summarize our preferred alternatives.

So Site 22A is about 504 acres, and it is made up of five separate groups of storage magazines. And these magazines were constructed in the mid-1940s, and they were in use until 2001, and they were used to store munitions and explosives. There are total of

103 magazines spread out amongst these different groups, which we call Groups 1 through 5 storage magazines.

Go ahead.

This figure [Slide 9] shows where the different groups are located in the inland area of Concord, and the sites are at the base of the foothills.

I didn't remember the pointer, but . . .

All the groups are interconnected by railroad spurs, and they are surrounded by open grasslands except for Group 1 right here, which is the farthest north and the smallest magazine group; and it's located next to

buildings, and essentially it was used to store small amount of explosives that were used in these buildings when they were testing different types of weapons there.

And all the other ones are quite large in size, as you can see here.

The magazine groups -- well, the City of Concord has developed a reuse plan for the inland area, and this figure shows where the magazine groups fall within the City of Concord's reuse project area plan.

Group 1 is up in this area [indicating], and I'm going to have to use my notes. It's in a commercial flex zone.

Group 2 covers several different types of reuse: this conservation open space, then a tiny bit of a commercial flex area; and then greenways, citywide parks, and tournament facilities is the darker green color.

And Groups 3, 4, and 5 are in areas that are

20 designated to be developed -- or not developed because
21 it's conservation open space.
22 So several investigations have been conducted
23 at Site 22A since 2005. The first investigation started
24 because arsenic was found in the surface soil at an
25 entirely different site, at Site 22; and it is also a

11

1 group of storage magazines. It's not part of this
2 Proposed Plan or part of this site. But because arsenic
3 was found at a similar site, the Navy went out and
4 collected samples of the soil around these five magazine
5 groups.
6 We found that there were arsenic concentrations
7 around the magazines that were above the background
8 concentration for arsenic, which is 10 milligrams per
9 kilogram. So because we did see some elevated arsenic
10 concentrations, we followed up the site investigation
11 with a remedial investigation to further characterize
12 the site.
13 And after that we did an additional
14 investigation of a small area southeast of the Group 3
15 magazine area to determine if hay containing arsenic was
16 burned nearby. That investigation indicated that the
17 area near Magazine Group 3 was not used to burn
18 arsenic-contaminated hay.
19 Based on these investigations, we came up with
20 a consite -- conceptual site model that describes the
21 nature and extent of arsenic. And arsenic is elevated
22 around the perimeter and over the tops of a subset of
23 the magazines, 'cause you can see that the storage
24 magazines are covered with earth, and that is consistent

25 with application of herbicide around the magazines and

12

1 on top of the magazines to control grasses and prevent
2 fire.
3 We found that when the concentrations are above
4 background, it's typically in the upper 6 inches of the
5 soil in the Groups 2 through 5 magazine area.
6 Magazine Group 1, which was that tiny -- the
7 smaller magazines associated with the buildings, we did
8 not find arsenic above the background concentration.
9 So the remedial investigation calculated cancer
10 and noncancer risks and also risks to ecological
11 receptors.
12 So what is risk? Risk is the likelihood or
13 probability that a hazardous chemical, such as arsenic,
14 when released into the environment will cause adverse
15 effects to exposed humans or other organisms.
16 We looked at both cancer and noncancer risk,
17 and I'll be talking about them for a while. So just
18 wanted to kind of describe a little bit about what they
19 are.
20 Noncancer risk is calculated using a hazard
21 index, and that risk doesn't change if you use the
22 federal risk methodology or if you use the State of
23 California risk methodology.
24 Cancer risk is normally expressed as a
25 probability. For example, 5 times 10 to the minus 5

13

1 would mean five extra cancer cases in a population of
2 100,000 people.

3 And when you use the State of California
4 toxicity values and federal values, you will come up
5 with two different cancer risk estimates for arsenic in
6 surface soil. So because you -- you can get two
7 different risks, we did calculate the risks using both
8 the federal and the State of California toxicity
9 criteria.
10 Although we did look at both risks, the Navy
11 uses the federally established risk management range,
12 which is 1 times 10 to the minus 6 to 10 to the minus 4
13 to evaluate site cancer risks.
14 When you look at the risk and if it's above
15 that range, so if there's more than one additional
16 cancer case at a population of 10,000, normally action
17 would be warranted or some sort of land-use controls
18 remediation. Something would be done.
19 If the risk falls within that risk management
20 range, you look at site-specific factors to decide
21 whether or not you should do something at that site.
22 And if your risk is below one additional excess
23 cancer case in a population of a million, then normally
24 no action is performed or done at all.
25 So arsenic is naturally occurring. It's in

14

1 soils. It's in rocks. And it is present naturally out
2 at Site 22A, which sort of complicates things a little
3 bit compared to other chemicals that are not ever
4 present in the natural environment.
5 The background concentration of arsenic in the
6 soil at Site 22A is 10 milligrams per kilogram, and
7 there are cancer risks and noncancer hazards associated

with the background concentration of arsenic in the soil.

So when we looked at those risks using federal toxicity criteria, we found that the risks from the background levels of arsenic in the soil alone resulted in risk to a residential person. That's within that risk management range.

And when we calculated using State of California toxicity criteria, we found that the background risk from arsenic was above the risk management range.

So the next two slides are going to summarize the results of the remedial investigation risk assessment for human health.

We looked at risk to four different types of people that are either currently present at the site or may be present at the site. Those people we call potential receptors.

15

We looked at the current rancher because right now the four magazine areas that are in the grassland area are used for grazing. So there is a rancher that's out there. And we looked at future industrial worker, a future construction worker, and a future resident.

And there are no plans to use any of these magazine groups for residential use, but we did evaluate the future resident as a potential receptor.

And the risk assessment considered ways that a person could be exposed to arsenic in soil. Someone could eat it accidentally. You could come in contact with arsenic in soil, and it could move through your

13 skin. You can inhale soil particles that have arsenic
14 attached to it. So those are the things that were
15 considered in our risk assessment.
16 And we didn't calculate risks for the Group 1
17 magazine area because all the arsenic concentrations
18 that we found in that group when we did our sampling
19 were below the background value.
20 So for the nonresidential receptors -- that
21 would be the rancher, the future industrial worker, and
22 a construction worker -- we found that all of the
23 magazine groups were suitable for nonresidential uses.
24 The incremental cancer risks, which are those
25 above background, are either below or within the risk

16

1 management range using federal and State of California
2 toxicity criteria.
3 And the noncancer hazard index was below 1 for
4 all the magazine areas.
5 For the residential receptor, we found that the
6 incremental cancer risks are within the risk management
7 range using federal toxicity criteria.
8 However, when we used State of California
9 toxicity criteria, the cancer -- the incremental risks
10 are within the risk management range for Group 2, and
11 they are slightly above the risk management range for
12 Groups 3 through 5.
13 The noncancer hazard index was below -- at or
14 below 1 for the residential receptors for all of the
15 magazine groups.
16 Our ecological risk assessment was conducted as
17 part of the remedial investigation. We looked at risks

18 to plants, invertebrates, amphibians, birds, and
19 mammals; and it was concluded that exposure to arsenic
20 in soil at Site 22A would not cause adverse effects on
21 plants or animals. So we found no unacceptable
22 ecological risk.
23 The RI Report recommended two main things: One
24 was no action for the Group 1 magazine area, and that
25 was because we didn't find elevated concentrations of

17

1 arsenic.
2 And we recommended that a feasibility study be
3 performed for Groups 2, 3, 4, and 5 to evaluate arsenic
4 in surface soil because of the potential risk to future
5 residents.
6 The feasibility study included an objective for
7 our remedial action, and that is to reduce exposure of
8 potential future residents to arsenic in surface soils
9 that could cause a cancer risk above the risk management
10 range or that could result in a hazard index greater
11 than 1.
12 To achieve that remedial objective, we
13 developed a remedial goal, and that remedial goal for
14 the surface soil is 22 milligrams per kilogram.
15 Concentrations in the soil at that level would result in
16 a noncancer hazard index of 1. So if you had
17 concentrations above 22 milligrams, you would have a
18 noncancer hazard index greater than 1, and that could
19 pose a potential risk.
20 So we calculated something called an
21 exposure-point concentration for each of the magazine
22 groups. And an exposure-point concentration is hard to

23 describe. It's a statistically derived concentration
24 for arsenic that represents an average of arsenic in the
25 soil for an area.

18

1 So we calculated the exposure-point
2 concentration for each one of the magazine groups
3 separately, and we used that sort of average to estimate
4 our risks.
5 And this table --
6 Oop. Go back.
7 This table summarizes the exposure-point
8 concentrations that we found, and it compares them to
9 the remedial goal that we have of 22 milligrams per
10 kilogram.
11 And you can see we have highlighted the EPC, or
12 exposure-point concentration, for Group 3 and Group 5.
13 Those exceed our remedial goal. All the other
14 concentrations for the three other groups are below our
15 remedial goal of 22 milligrams per kilogram.
16 So the feasibility study included four
17 different alternatives to address arsenic that's present
18 in the surface soil. The first alternative was no
19 action.
20 The second alternative was land-use controls.
21 And in this case, we were looking at controls that would
22 prohibit residential use of the magazine areas.
23 The third alternative was excavation of soil
24 that had concentrations above the remedial goal and
25 off-site disposal of that soil.

19

1 And the fourth alternative was excavation of

soil with concentrations above our remedial goal of 22 milligrams per kilogram and consolidation of that soil and containment in a smaller area of our site and then land-use controls over that smaller area that would prohibit residential use and, you know, any activities in that consolidated area of contamination.

And the feasibility study also indicated that we could select a different remedy for each of the different magazine groups throughout Site 22A.

This slide [24] shows the comparison criteria that we use to evaluate the alternatives. These are specified in the NCP, and all of the alternatives were compared to these criteria, and they were also compared to each other. And the reason we do this is so that we can see which alternative would be the best for us to implement, considering all things.

We look at overall protection of human health; compliance with applicable or relevant and appropriate requirements; long-term effectiveness; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost; state acceptance, and the last one is community acceptance.

So that ninth criterion will be evaluated after this public meeting and after the public comment period

on the Proposed Plan has been completed. So we would like to hear from the public. It's one of the things we need to evaluate and we want to evaluate. So we're hoping that we get some comments.

The details of this analysis I'm not going to go over right now. Those are all included in the

7 Feasibility Study Report, and copies of those -- of that
8 report and other previous reports are available at the
9 library or the administrative record file, which Scott
10 mentioned earlier.
11 So these are the preferred alternatives that we
12 are recommending at this point, and I'm going to go
13 through them for each of the different groups.
14 So for Magazine Group 1, Alternative 1 is what
15 we are selecting. The reason for that is the
16 concentrations of arsenic are below background. And
17 additionally, we recommended no action in the remedial
18 investigation, and we didn't even really carry this
19 group, you know, through the feasibility study process
20 in its entirety.
21 For Al- -- For Magazine Groups 2 and 4, no
22 action is also the preferred alternative. It's
23 protective of human health and the environment. The
24 exposure-point concentrations do not exceed the remedial
25 goal. The cancer risks for future residents using

1 federal toxicity criteria are not above the risk
2 management range. The noncancer hazard indices are not
3 above 1. And there's no unacceptable ecological risks.
4 The no-action alternative ranked favorably in
5 the nine-criteria analysis. It's highly effective in
6 the short term with no associated worker, community, or
7 environmental risks. It doesn't require any time to
8 implement. It's most cost effective to implement.
9 For Magazine Groups 3 and 5, land-use controls
10 are our preferred alternative. Land-use controls that
11 prohibit residential use of these magazine groups would

be protective of human health and the environment. It prevents exposure by restricting residential use of the property. Residential reuse is not planned for these areas. Exposure to arsenic in soil does not cause adverse effects to plants or animals.

It ranked favorably in the nine-criteria analysis. It's also highly effective in the short term; has no associated worker, community, or environmental risks. It can be quickly and easily implemented. It's the most cost-effective way to reduce exposure to these potential residents, and it's consistent with the City of Concord's reuse project area plan.

So what's next? The public comment period on the Proposed Plan started November 5th, and it continues

until December 20th. All comments that we receive we will prepare responses to. They will be submitted in the responsiveness summary of the Record of Decision.

And so this is how you can provide comments: Tonight you can comment verbally or in writing after this presentation and throughout the evening. After this meeting, you can mail, E-mail, or fax Scott Anderson at the BRAC Program Management Office West, 1455 Frazee Road, Suite 900, San Diego, California 92108, or you can E-mail him at scott.d.anderson -- this is for the record -- @navy.mil.

Comments must be received or postmarked no later than December 20th.

MR. ANDERSON: And Valerie?

MS. HARRIS: Yes.

MR. ANDERSON: Also what I didn't mention is

17 for written comments, we do have a folder in the back
18 that you can -- if you have any written comments, you
19 can place those in the folder back -- in the back of the
20 room tonight. Thanks. Sorry.
21 MS. HARRIS: That's okay.
22 So we have already mentioned this, but we put
23 together the information repository that has different
24 reports and technical information that is accessible to
25 the public, and it provides the background that supports

our remedial action alternative decision. And these documents are available at the Concord Public Library or in the administrative record file in San Diego. And the addresses for those are listed on this slide [30].

So that concludes my presentation or my summary of the Proposed Plan. You are welcome to walk around and look at the posters. And if you have any clarifying questions on the presentation, I can answer it now; but this is not the time to question the Proposed Plan or provide comments on the Proposed Plan for the record. Any questions that you ask right now are questions that you may ask to the Navy or the regulators as they are standing up here along the poster boards, won't be part of the official record.

So if you want something to be in the record, you need to come and talk to the court reporter, and she will add it to the record, or you can submit a comment in writing.

So now we're off the record for some clarifying questions.

(Whereupon, off record from

6:44 p.m. to 6:54 p.m.)

COMMENT

BY BRIAN HOLT:

My name is Brian Holt. I'm with the East Bay

24

Regional Park District. I have three concerns regarding the Proposed Plan.

The first concern is that the materials have not necessarily been properly noticed on the -- their Web site, the BRAC PMO Web site, in a way that would enable the Navy and others to be able to gauge community concern as a modifying criteria to the project.

The concern regarding the Proposed Plan is specifically regarding Sites 3 and 5 within the magazine areas and the land-use controls, the -- for -- land-use controls restricting residential use. Future plans for that area call for the removal of the bunkers that will potentially cause soil disturbance and future regrading of the site for -- for parks and recreation use, passive recreational use, and habitat conservation. So not necessarily playgrounds, but -- but passive recreational use.

So the concern is just as those bankers are removed, what would the obligation of the Contra Costa County taxpayers be regarding the future regulatory and cleanup requirements for the site?

So if there's arsenic in the site that's being kept there by the Navy and if a future landowner were to come in and need to modify the site, would that future landowner be obligated to address the contamination for

25

what is not a residential use?

So -- and this gets at just one of the other criterias there, which was basically a consistency with the Concord reuse plan.

So we have just started to review this plan, and these are really just questions at this point, and they intend to submit comments and look into it closer. But that's our concern.

(Whereupon, off record from 6:57 p.m. to 7:10 p.m.)

MR. ANDERSON: This is Scott Anderson of the Navy. It's currently 7:10, and there's no more public or RAB members currently at the meeting. Therefore, we're officially closing the record.

(Off record at 7:11 p.m., 12/5/12.)

---oOo---

CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified Shorthand Reporter of the State of California, do hereby certify

CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified Shorthand Reporter of the State of California, do hereby certify that this 27-page transcript of the foregoing meeting was reported by me stenographically to the best of my ability at the time and place aforementioned.

IN WITNESS WHEREOF, I have hereunto set my hand this 19th day of December, 2012.

CHRISTINE M. NICCOLI, C.S.R. NO. 4569

APPENDIX D
ADMINISTRATIVE RECORD

(Administrative Record Provided on CD)

NWS CONCORD (DETACHMENT TO SEAL BEACH)

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORDS PERTAINING TO IR SITE 22A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60036_001750 CORRESPONDENCE 2	**06-12-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF THE DRAFT REMEDIAL INVESTIGATION REPORT, INLAND AREA, VOLUMES I AND II	YES	SITE 00012 SITE 00013 SITE 00017 SITE 00022 SITE 00022A SITE 00024A SITE 00027
AR_N60036_000086 CORRESPONDENCE 3	**02-02-2007**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR ADDITIONAL INVESTIGATION, GROUPS 1 THROUGH 5, MAGAZINE AREAS (ENCLOSURE IS RECORD # 87)	YES	SITE 00022A
AR_N60036_001594 MINUTES 54	**02-07-2007**	TETRA TECH EM, INC.	07 FEBRUARY 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES LIST OF ATTENDEES, AGENDA, AND VARIOUS HANDOUTS)	YES	SITE 00022A SITE 00029 SWMU 00002 SWMU 00007 SWMU 00018
AR_N60036_000114 CORRESPONDENCE 3	**06-05-2007**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR ADDITIONAL INVESTIGATION, GROUPS 1 THROUGH 5 MAGAZINE AREAS (ENCLOSURE IS RECORD # 115)	YES	SITE 00022A

NWS CONCORD (DETACHMENT TO SEAL BEACH)

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORDS PERTAINING TO IR SITE 22A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60036_000160 FACT SHEET 12	**07-01-2007**	BRAC PMO WEST	FACT SHEET: ENVIRONMENTAL RESTORATION PROGRAM - ACTIVITIES IN THE INLAND AREA	YES	BLDG IA-020 BLDG IA-025 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00022A SITE 00023A SITE 00023B SITE 00024A SITE 00024B SITE 00027 SITE 00029 SWMU 00002 SWMU 00003 SWMU 00005 SWMU 00007 SWMU 00018 SWMU 00018D

NWS CONCORD (DETACHMENT TO SEAL BEACH)

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORDS PERTAINING TO IR SITE 22A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60036_001853 CORRESPONDENCE 6	**07-17-2007**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT INLAND AREA AMENDED SITE MANAGEMENT PLAN FISCAL YEAR 2008 UPDATE [SEE RECORD # 120 - DRAFT INLAND AREA AMENDED SITE MANAGEMENT PLAN FISCAL YEAR 2008 UPDATE]	NO	SITE 00013 SITE 00022 SITE 00022A SITE 00027 SITE 00029
AR_N60036_001865 CORRESPONDENCE 7	**07-31-2007**	NAVY ENVIRONMENTAL HEALTH CENTER - PORTSMOUTH, VA	HEALTH AND SAFETY PLAN REVIEW (SEE RECORD # 1864 - NAVY ENVIRONMENT OF PUBLIC HEALTH CENTER TRANSMITTAL LETTER)	NO	SITE 00022A
AR_N60036_001597 CORRESPONDENCE 18	**10-09-2007**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL INLAND AREA AMENDED SITE MANAGEMENT PLAN FISCAL YEAR 2008 UPDATE (W/ ENCLOSURE) [CD COPY ENCLOSED] (SEE RECORD # 1418 - SITE MANAGEMENT PLAN FOR INLAND AREA)	YES	"PERCHLORATE " SEARCH - ROUND 1 SITE 00013 SITE 00022 SITE 00022A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018

NWS CONCORD (DETACHMENT TO SEAL BEACH)

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORDS PERTAINING TO IR SITE 22A

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N60036_001641 MINUTES 42	**11-07-2007**	SULTECH	07 NOVEMBER 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, INLAND AREA {INCLUDES LIST OF ATTENDEES, FINAL AGENDA, AND VARIOUS HANDOUTS) (CD COPY ENCLOSED)	YES	BLDG IA-020 BLDG IA-025 BLDG IA-036 SITE 00022 SITE 00022A SITE 00023A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_000165 REPORT 198	**11-14-2007**	TETRA TECH EM, INC.	FINAL ACCIDENT PREVENTION PLAN FOR THE REMEDIAL INVESTIGATION, GROUPS 1 THROUGH 5, MAGAZINE AREAS (CD COPY ENCLOSED)	YES	SITE 00022A
AR_N60036_001634 MINUTES 37	**02-06-2008**	TETRA TECH EM, INC.	06 FEBRUARY 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM (CD COPY ENCLOSED) {INCLUDES LIST OF ATTENDEES, FINAL AGENDA, AND VARIOUS HANDOUTS)	YES	SITE 00022 SITE 00022A SITE 00027 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018

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AR_N60036_001822 MINUTES 31	**06-04-2008**	TETRA TECH EM, INC.	04 JUNE 2008 FINAL MEETING MINUTES, RESTORATION ADVISORY BOARD (RAB), INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM (INCLUDES LIST OF ATTENDEES, AGENDA, VARIOUS HANDOUTS, AND CD COPY)	YES	BLDG IA-020 BLDG IA-025 BLDG IA-036 SITE 00001 SITE 00022 SITE 00022A SITE 00024A SITE 00027 SITE 00029
AR_N60036_000175 REPORT 10	**09-15-2008**	SULTECH	FINAL AMENDMENT TO THE SITE MANAGEMENT PLAN SCHEDULE, INLAND AREA SITES (CD COPY ENCLOSED) [SEE RECORD # 169 - BRAC PMO WEST TRANSMITTAL LETTER]	NO	SITE 00013 SITE 00022 SITE 00022A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_000074 CORRESPONDENCE 2	**09-19-2008**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT REMEDIAL INVESTIGATION REPORT (ENCLOSURE IS RECORD # 76)	NO	SITE 00022A

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AR_N60036_001916 MINUTES 31	**10-01-2008**	TETRA TECH EM, INC.	01 OCTOBER 2008 FINAL MEETING MINUTES RESTORATION ADVISORY BOARD (RAB) INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM (INCLUDES LIST OF ATTENDEES, AGENDA, VARIOUS HANDOUTS, AND CD COPY) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	NO	BLDG IA-020 BLDG IA-027 BLDG IA-036 SITE 00022A SITE 00023A SITE 00024A SITE 00027 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_001863 CORRESPONDENCE 5	**11-20-2008**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION (SEE RECORD # 76 - DRAFT REMEDIAL INVESTIGATION)	NO	SITE 00022 SITE 00022A
AR_N60036_001866 CORRESPONDENCE 1	**11-21-2008**	CRWQCB - OAKLAND, CA	REVIEW AND NO COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT [SEE RECORD # 76 - DRAFT REMEDIAL INVESTIGATION REPORT]	NO	SITE 00022A
AR_N60036_002030 CORRESPONDENCE 2	**01-15-2009**	BRAC PMO WEST	SCHEDULE EXTENSION FOR THE PERIOD OF RESPONDING TO COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT, INLAND AREA FOR AN ADDITIONAL 30 DAYS [SEE RECORD # 1971 - DRAFT REMEDIAL INVESTIGATION REPORT]	NO	SITE 00022A

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AR_N60036_001917 MINUTES 33	**02-04-2009**	TETRA TECH EM, INC.	04 FEBRUARY 2009 FINAL MEETING MINUTES RESTORATION ADVISORY BOARD (RAB) INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM (INCLUDES LIST OF ATTENDEES, AGENDA, VARIOUS HANDOUTS, AND CD COPY)	NO	SITE 00013 SITE 00022 SITE 00022A SITE 00023A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_001970 CORRESPONDENCE 2	**02-24-2009**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT, INLAND AREA (ENCLOSURE IS RECORD # 1971)	NO	SITE 00022A
AR_N60036_001902 CORRESPONDENCE 32	**03-01-2009**	TETRA TECH EM, INC.	CORRECTED RESPONSE TO COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT (CD COPY ENCLOSED) [SEE RECORD # 76 - DRAFT REMEDIAL INVESTIGATION REPORT]	NO	SITE 00022A
AR_N60036_002031 CORRESPONDENCE 2	**03-26-2009**	BRAC PMO WEST	SCHEDULE EXTENSION FOR THE PERIOD OF REGULATORY REVIEW ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT, INLAND AREA FOR AN ADDITIONAL 30 DAYS [SEE RECORD # 1971 - DRAFT FINAL REMEDIAL INVESTIGATION REPORT]	NO	SITE 00022A
AR_N60036_001901 CORRESPONDENCE 2	**03-31-2009**	BRAC PMO WEST	TRANSMITTAL OF THE CORRECTED RESPONSES TO COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORT (ENCLOSURE IS RECORD #1902)	NO	SITE 00022A

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AR_N60036_001920 MINUTES 66	**04-01-2009**	TETRA TECH EM, INC.	01 APRIL 2009 FINAL MEETING MINUTES RESTORATION ADVISORY BOARD (RAB) INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM (INCLUDES LIST OF ATTENDEES, AGENDA, VARIOUS HANDOUTS, AND CD COPY) [DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS]	NO	SITE 00013 SITE 00022 SITE 00022A SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_002169 CORRESPONDENCE 7	**04-10-2009**	DTSC - SACRAMENTO, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT, INLAND AREA (INCLUDES REVIEW AND COMMENTS BY STANTON, B. WITH THE CALIFORNIA DEPARTMENT OF FISH AND GAME - SACRAMENTO, CA)	NO	SITE 00022 SITE 00022A
AR_N60036_001937 CORRESPONDENCE 1	**04-24-2009**	BRAC PMO WEST	SUBMISSION OF COMMENTS NOT REQUIRED BECAUSE CONCERNS WILL BE ADDRESSED IN THE RESPONSES TO COMMENTS THAT WILL BECOME PART OF THE FINAL REMEDIAL INVESTIGATION	NO	SITE 00022A
AR_N60036_001938 CORRESPONDENCE 2	**05-18-2009**	CALIFORNIA DEPARTMENT OF FISH AND GAME - SACRAMENTO, CA	ADDITIONAL RESPONSE TO COMMENTS ON THE REMEDIAL INVESTIGATION (SEE RECORD # 76 - DRAFT REMEDIAL INVESTIGATION)	NO	SITE 00022A
AR_N60036_001971 REPORT 662	**06-01-2009**	TETRA TECH EM, INC.	FINAL REMEDIAL INVESTIGATION REPORT, INLAND AREA (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT, DATED 24 FEBRUARY 2009 TO FINAL, AND CD COPY) [SEE RECORD # 1970 AND # 1972 - BRAC PMO WEST TRANSMITTAL LETTERS]	NO	SITE 00022A

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AR_N60036_001972 CORRESPONDENCE 2	**06-01-2009**	BRAC PMO WEST	TRANSMITTAL OF THE REPLACEMENT PAGES CONVERTING THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT, INLAND AREA, DATED 24 FEBRUARY 2009, TO FINAL (ENCLOSURE IS RECORD # 1971)	NO	SITE 00022A
AR_N60036_001921 CORRESPONDENCE 2	**06-15-2009**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT AMENDMENT TO THE SITE MANAGEMENT PLAN SCHEDULE, INLAND AREA SITES (ENCLOSURE IS RECORD # 1922)	NO	SITE 00022A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_001939 CORRESPONDENCE 1	**06-16-2009**	BRAC PMO WEST	INVITATION TO ACCOMPANY TETRA TECH DURING SAMPLING AT HISTORICAL BURN AREA	NO	SITE 00022A
AR_N60036_001940 CORRESPONDENCE 1	**06-22-2009**	BRAC PMO WEST	NOTIFICATION THAT TETRA TECH WILL BE TAKING SAMPLES IN ALLEGED BURN AREA ON 24 JUNE 2009	NO	SITE 00022A
AR_N60036_001941 CORRESPONDENCE 1	**06-22-2009**	U.S. EPA - SAN FRANCISCO, CA	RESPONSE TO NOTIFICATION THAT TETRA TECH WILL BE TAKING SAMPLES IN ALLEGED BURN AREA ON 24 JUNE 2009	NO	SITE 00022A

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AR_N60036_002168 CORRESPONDENCE 3	**07-16-2009**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT AMENDMENT TO THE SITE MANAGEMENT PLAN SCHEDULE - INLAND AREA SITES (SEE RECORD # 1922 - DRAFT AMENDMENT TO THE SITE MANAGEMENT PLAN SCHEDULE - INLAND AREA SITES)	NO	SITE 00013 SITE 00022 SITE 00022A SITE 00027 SITE 00029
AR_N60036_002076 MINUTES 39	**08-04-2010**	CHADUX - TT, JOINT VENTURE	4 AUGUST 2010 FINAL RESTORATION ADVISORY BOARD (RAB) ENVIRONMENTAL RESTORATION PROGRAM MEETING MINUTES, INLAND AREA [INCLUDES ATTENDEES LIST, AGENDA, 4 AUGUST 2010 REMEDIAL PROJECT MANAGERS (RPM) UPDATE, VARIOUS HANDOUTS, AND CD COPY]	NO	BLDG IA-007 BLDG IA-012 BLDG IA-015 BLDG IA-016 BLDG IA-051 SITE 00022 SITE 00022A SITE 00024A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018

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AR_N60036_002046 CORRESPONDENCE 24	**08-13-2010**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT FINAL AMENDMENT TO THE SITE MANAGEMENT PLAN SCHEDULE, INLAND AREA SITES (W/ ENCLOSURE)	NO	SITE 00013 SITE 00022 SITE 00022A SITE 00024A SITE 00027 SITE 00029 SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_002049 CORRESPONDENCE 2	**08-13-2010**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT FEASIBILITY STUDY (ENCLOSURE IS RECORD # 2050)	NO	SITE 00022A
AR_N60036_002091 CORRESPONDENCE 7	**10-12-2010**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY (W/ ENCLOSURE) [SEE RECORD # 2050 - DRAFT FEASIBILITY STUDY]	NO	SITE 00022A
AR_N60036_002092 CORRESPONDENCE 1	**10-12-2010**	CRWQCB - OAKLAND, CA	REVIEW AND CONCURRENCE WITH THE DRAFT FEASIBILITY STUDY (SEE RECORD # 2050 - DRAFT FEASIBILITY STUDY)	NO	SITE 00022A
AR_N60036_002105 CORRESPONDENCE 2	**01-07-2011**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT FINAL FEASIBILITY STUDY (ENCLOSURE IS RECORD # 2106)	NO	SITE 00022A

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AR_N60036_002107 CORRESPONDENCE 2	**01-10-2011**	BRAC PMO WEST	TRANSMITTAL OF THE ERRATA PAGES FOR THE DRAFT FINAL FEASIBILITY STUDY (ENCLOSURE IS RECORD # 2106)	NO	SITE 00022A
AR_N60036_002153 MINUTES 41	**02-02-2011**	CHADUX - TT, JOINT VENTURE	02 FEBRUARY 2011 FINAL RESTORATION ADVISORY BOARD (RAB) INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM MEETING MINUTES (INCLUDES LIST OF ATTENDEES, AGENDA, VARIOUS HANDOUTS, AND CD COPY) [SEE RECORD # 2152 - TETRA TECH EM INC TRANSMITTAL LETTER]	NO	SITE 00022 SITE 00022A SITE 00027 SITE 00029
AR_N60036_002145 CORRESPONDENCE 1	**03-09-2011**	BRAC PMO WEST	TRANSMITTAL OF THE FINAL FEASIBILITY STUDY (ENCLOSURE IS RECORD # 2146)	NO	SITE 00022A
AR_N60036_002146 REPORT 259	**03-09-2011**	CHADUX - TT, JOINT VENTURE	FINAL FEASIBILITY STUDY (CD COPY ENCLOSED) [SEE RECORD # 2145 - BRAC PMO WEST TRANSMITTAL LETTER]	NO	SITE 00022A
AR_N60036_002233 MINUTES 38	**04-06-2011**	CHADUX - TT, JOINT VENTURE	FINAL RESTORATION ADVISORY BOARD (RAB) INLAND AREA ENVIRONMENTAL RESTORATION PROGRAM MEETING MINUTES (INCLUDES ATTENDEES, AGENDA, VARIOUS HANDOUTS, AND CD COPY) [SEE RECORD # 2232 - TETRA TECH EM INC. TRANSMITTAL LETTER]	NO	SITE 00022A SWMU 00002 SWMU 00005 SWMU 00007 SWMU 00018
AR_N60036_002158 CORRESPONDENCE 2	**06-22-2011**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT PROPOSED PLAN FOR INLAND AREA (ENCLOSURE IS RECORD # 2159)	NO	SITE 00022A

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AR_N60036_002166 CORRESPONDENCE 2	**08-01-2011**	CITY OF CONCORD - CONCORD, CA	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA (CD COPY ENCLOSED) [SEE RECORD # 2159 - DRAFT PROPOSED PLAN FOR INLAND AREA]	NO	SITE 00022A
AR_N60036_002188 CORRESPONDENCE 4	**08-29-2011**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA (CD COPY ENCLOSED) [SEE RECORD # 2159 - DRAFT PROPOSED PLAN FOR INLAND AREA]	NO	SITE 00022A
AR_N60036_002189 CORRESPONDENCE 1	**08-30-2011**	DTSC - SACRAMENTO, CA	REVIEW AND NO COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA (CD COPY ENCLOSED) [SEE RECORD # 2159 - DRAFT PROPOSED PLAN FOR INLAND AREA]	NO	SITE 00022A
AR_N60036_002204 CORRESPONDENCE 2	**10-20-2011**	U.S. DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE - SACRAMENTO, CA	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA [CD COPY ENCLOSED] (SEE RECORD # 2159 - DRAFT PROPOSED PLAN FOR INLAND AREA)	NO	SITE 00022A
AR_N60036_002205 CORRESPONDENCE 3	**10-20-2011**	BRAC PMO WEST	RESPONSES TO COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA [CD COPY ENCLOSED] (SEE RECORD # 2204 - U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE REVIEW AND COMMENTS)	NO	SITE 00022A
AR_N60036_002220 CORRESPONDENCE 14	**10-26-2011**	CHADUX - TT, JOINT VENTURE	RESPONSES TO COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA (CD COPY ENCLOSED)	NO	SITE 00022A
AR_N60036_002221 CORRESPONDENCE 2	**10-28-2011**	BRAC PMO WEST	TRANSMITTAL OF THE 1) DRAFT FINAL PROPOSED PLAN FOR INLAND AREA; AND 2) RESPONSES TO COMMENTS ON THE DRAFT PROPOSED PLAN FOR INLAND AREA (ENCLOSURE 1 IS RECORD # 2222 AND ENCLOSURE 2 IS RECORD # 2220)	NO	SITE 00022A

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AR_N60036_002536 MINUTES 57	**12-07-2011**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	07 DECEMBER 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (INCLUDES AGENDA, LIST OF ATTENDEES, CD COPY, AND VARIOUS HANDOUTS) [SEE RECORD # 2535 - TETRA TECH EM, INC. TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	SITE 00022 SITE 00022A SITE 00027 SITE 00029
AR_N60036_002265 CORRESPONDENCE 12	**02-14-2012**	DTSC - SACRAMENTO, CA	REVIEW AND COMMENTS ON THE 1) DRAFT PROPOSED PLAN FOR INLAND AREA; AND 2) DRAFT FINAL PROPOSED PLAN FOR INLAND AREA (SEE RECORD # 2159 - DRAFT PROPOSED PLAN FOR INLAND AREA; AND RECORD # 2222 - DRAFT FINAL PROPOSED PLAN FOR INLAND AREA)	NO	SITE 00022A
AR_N60036_002538 MINUTES 40	**04-04-2012**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	04 APRIL 2012 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (INCLUDES AGENDA, LIST OF ATTENDEES, VARIOUS HANDOUTS, AND CD COPY) [SEE RECORD # 2537 – TETRA TECH EM, INC. TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	SITE 00022 SITE 00022A SITE 00024A SITE 00029
AR_N60036_002535 CORRESPONDENCE 1	**04-10-2012**	TETRA TECH EM, INC.	TRANSMITTAL OF THE 07 DECEMBER 2011 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (ENCLOSURE IS RECORD # 2536)	NO	SITE 00022 SITE 00022A SITE 00027 SITE 00029
AR_N60036_002268 CORRESPONDENCE 22	**06-07-2012**	CHADUX - TT, JOINT VENTURE	RESPONSES TO COMMENTS ON THE 1) DRAFT PROPOSED PLAN FOR INLAND AREA; AND 2) DRAFT FINAL PROPOSED PLAN FOR INLAND AREA (SEE RECORD # 2265 - REVIEW AND COMMENTS)	YES	SITE 00022A
AR_N60036_002266 CORRESPONDENCE 3	**06-08-2012**	BRAC PMO WEST	TRANSMITTAL OF THE 1) REVISED DRAFT PROPOSED PLAN FOR INLAND AREA; AND 2) RESPONSES TO COMMENTS ON THE DRAFT PROPOSED PLAN, AND THE DRAFT FINAL PROPOSED PLAN (ENCLOSURE 1 IS RECORD # 2267; AND ENCLOSURE 2 IS RECORD # 2268)	YES	SITE 00022A

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AR_N60036_002283 CORRESPONDENCE 2	**07-31-2012**	CRWQCB - OAKLAND, CA	REVIEW AND COMMENTS ON THE REVISED DRAFT PROPOSED PLAN FOR INLAND AREA (SEE RECORD # 2267 - REVISED DRAFT PROPOSED PLAN FOR INLAND AREA)	YES	SITE 00022A
AR_N60036_002282 CORRESPONDENCE 3	**08-06-2012**	U.S. EPA - SAN FRANCISCO, CA	REVIEW AND COMMENTS ON THE REVISED DRAFT PROPOSED PLAN FOR INLAND AREA (SEE RECORD # 2267 - REVISED DRAFT PROPOSED PLAN FOR INLAND AREA)	YES	SITE 00022A
AR_N60036_002281 CORRESPONDENCE 2	**08-07-2012**	CITY OF CONCORD - CONCORD, CA	REVIEW AND COMMENTS ON THE REVISED DRAFT PROPOSED PLAN FOR INLAND AREA (SEE RECORD # 2267 - REVISED DRAFT PROPOSED PLAN FOR INLAND AREA)	YES	SITE 00022A
AR_N60036_002284 CORRESPONDENCE 8	**10-03-2012**	CHADUX - TT, JOINT VENTURE	RESPONSES TO COMMENTS ON THE REVISED DRAFT PROPOSED PLAN FOR INLAND AREA (CD COPY ENCLOSED) [SEE RECORDS # 2281 THROUGH # 2283 - REVIEW AND COMMENTS]	YES	SITE 00022A
AR_N60036_002542 MINUTES 55	**10-03-2012**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	03 OCTOBER 2012 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (INCLUDES AGENDA, LIST OF ATTENDEES, CD COPY, AND VARIOUS HANDOUTS) [SEE RECORD # 2541 – TETRA TECH EM, INC. TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	BLDG IA-027 SITE 00022A SITE 00024A
AR_N60036_002291 CORRESPONDENCE 3	**10-05-2012**	BRAC PMO WEST	TRANSMITTAL OF THE 1) DRAFT FINAL PROPOSED PLAN, AND 2) RESPONSES TO COMMENTS ON THE REVISED DRAFT PROPOSED PLAN (ENCLOSURE 1 IS RECORD # 2288, AND ENCLOSURE 2 IS RECORD # 2284)	YES	SITE 00022A
AR_N60036_002537 CORRESPONDENCE 1	**10-19-2012**	TETRA TECH EM, INC.	TRANSMITTAL OF THE 04 APRIL 2012 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (ENCLOSURE IS RECORD # 2538)	NO	SITE 00022 SITE 00022A SITE 00024 SITE 00029

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AR_N60036_002261 REPORT 19	**11-01-2012**	CHADUX - TT, JOINT VENTURE	FINAL PROPOSED PLAN FOR INLAND AREA (CD COPY ENCLOSED)	YES	SITE 00022A
AR_N60036_002292 PUBLIC NOTICE 4	**11-18-2012**	BAY AREA NEWS GROUP - SAN JOSE, CA	PUBLIC NOTICE ANNOUNCING THE PUBLIC COMMENT PERIOD ON THE PROPOSED PLAN (INCLUDES PROOF OF PUBLICATION; AND CD COPY)	YES	SITE 00022A
AR_N60036_002544 MINUTES 38	**01-16-2013**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	16 JANUARY 2013 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (INCLUDES AGENDA, LIST OF ATTENDEES, CD COPY, AND VARIOUS HANDOUTS) [SEE RECORD # 2543 – TETRA TECH EM, INC. TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	SITE 00022A SITE 00029
AR_N60036_002541 CORRESPONDENCE 1	**03-29-2013**	TETRA TECH EM, INC.	TRANSMITTAL OF THE 03 OCTOBER 2012 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (ENCLOSURE IS RECORD # 2542)	NO	SITE 00022A SITE 00024A
AR_N60036_002543 CORRESPONDENCE 1	**06-05-2013**	TETRA TECH EM, INC.	TRANSMITTAL OF THE 16 JANUARY 2013 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (ENCLOSURE IS RECORD # 2544)	NO	SITE 00022A SITE 00029
AR_N60036_002546 MINUTES 47	**07-10-2013**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	10 JULY 2013 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (INCLUDES AGENDA, LIST OF ATTENDEES, CD COPY, AND VARIOUS HANDOUTS) [SEE RECORD # 2545 – TETRA TECH EM, INC. TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	SITE 00022A SITE 00024A

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AR_N60036_002548 MINUTES 33	**01-15-2014**	TRIECO - TETRA TECH EM, INC., JOINT VENTURE	15 JANUARY 2014 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (INCLUDES AGENDA, LIST OF ATTENDEES, CD COPY, AND VARIOUS HANDOUTS) [SEE RECORD # 2547 – TETRA TECH EM, INC. TRANSMITTAL LETTER] {DOCUMENT ALSO CONTAINS SENSITIVE STREET LEVEL MAPS}	NO	BLDG 0000081 SITE 00022 SITE 00022A
AR_N60036_002497 REPORT 3530	**03-01-2014**	SES-TECH	FINAL REMOVAL ACTION SUMMARY REPORT (PHASE I) NON-TIME-CRITICAL REMOVAL ACTION (CD COPY ENCLOSED) [SEE RECORD # 2496 - BRAC PMO WEST TRANSMITTAL LETTER]	NO	SITE 00022A UXO 000001A
AR_N60036_002545 CORRESPONDENCE 1	**04-07-2014**	TETRA TECH EM, INC.	TRANSMITTAL OF THE 10 JULY 2013 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (ENCLOSURE IS RECORD # 2546)	NO	SITE 00022A SITE 00024A
AR_N60036_002547 CORRESPONDENCE 1	**04-07-2014**	TETRA TECH EM, INC.	TRANSMITTAL OF THE 15 JANUARY 2014 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES (ENCLOSURE IS RECORD # 2548)	NO	BLDG 0000081 SITE 00022 SITE 00022A
AR_N60036_002495 CORRESPONDENCE 2	**05-08-2014**	BRAC PMO WEST	TRANSMITTAL OF THE DRAFT FINAL RECORD OF DECISION (ENCLOSURE IS RECORD # 2492)	NO	SITE 00022A

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Total Estimated Record Page Count: 5,615

Total Records: 77

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