Record of Decision
Building 284 and Former Buildings 80 and 302
FORD ISLAND, PEARL HARBOR NAVAL COMPLEX, OAHU, HAWAII

August 2009

Department of the Navy
Naval Facilities Engineering Command, Hawaii
400 Marshall Road
Pearl Harbor, HI 96860-3139

Comprehensive Long-Term Environmental Action Navy
Contract Number N62742-03-D-1837, CTO HC04

CONTENTS

ATTACHMENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

AAS	Army Air Station
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tanks
AVGAS	aviation gasoline
bgs	below ground surface
Bldg.	building
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	chemicals of concern
COPC	chemical of potential concern
CSM	conceptual site model
DOH	Department of Health, State of Hawaii
DON	Department of the Navy
DRO	diesel range organics
EE/CA	engineering evaluation/cost analysis
EPA	Environmental Protection Agency, United States
EPC	exposure point concentrations
FFS	focused feasibility study
GRO	gasoline range organics
HAR	Hawaii Administrative Rules
HQ	hazard quotient
IAS	initial assessment study
IR	Installation Restoration
LTMM	long-term monitoring and maintenance
LRO	lube oil range organics
LUC	land use control
mg/kg	milligram per kilogram
msl	mean sea level
NAS	Naval Air Station
NAVFAC Hawaii	Naval Facilities Engineering Command, Hawaii
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
No.	number
NPL	National Priorities List
NTCRA	non-time-critical removal actions
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDF	portable document format
PHNC	Pearl Harbor Naval Complex
PHNHL	Pearl Harbor National Historic Landmark
PP	proposed plan
PRE	preliminary risk evaluation
PRG	preliminary remediation goal

RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RME	reasonable maximum exposure
ROD	record of decision
RSE	removal site evaluation
SARA	Superfund Amendments and Reauthorization Act
SRA	screening risk assessment
SSR	site summary report
SVOC	semivolatile organic compound
TBC	to-be-considered
TCLP	toxicity characteristic leaching procedure
TCRA	time-critical removal action
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
U.S.	United States
U.S.C.	United States Code
UST	underground storage tank
VOC	volatile organic compound
WP	work plan

1. Declaration

1.1 SITE NAME AND LOCATION

This record of decision (ROD) has been prepared by the United States (U.S.) Navy (Navy) for two hazardous substance sites: the Building (Bldg.) 284 Site and the Former Bldgs. 80 and 302 Site located on Ford Island. Ford Island is part of and located within the Pearl Harbor Naval Complex (PHNC), Oahu, Hawaii. A map showing the location of Ford Island is presented as Figure 1, and the locations of the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site are shown on Figure 2. The PHNC was added to the National Priority List (NPL) on 14 October 1992. The NPL identifies priorities among known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. PHNC is identified on the NPL as U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) number (No.) HI4170090076.

This ROD has been prepared for the Naval Facilities Engineering Command, Hawaii (NAVFAC Hawaii) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) III program, Contract No. N62742-03-D-1837, Contract Task Order No. HC04.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD documents, for the Administrative Record, the decision by the U.S. Department of the Navy (DON) and the EPA, with concurrence from the State of Hawaii Department of Health (DOH) to select the final remedy of Land Use Controls (LUCs) and Long-Term Monitoring and Maintenance (LTMM) for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. The final remedy for the Bldg. 284 Site includes LUCs, maintenance and inspection of the cap, and long-term monitoring of groundwater. The final remedy for the Former Bldgs. 80 and 302 Site includes LUCs and maintenance and inspection of the cap. The proposed remedy is required to mitigate potential risks to site users from exposure to contaminated subsurface soil.

The final remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and to the extent practicable the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the Office of the President of the U.S. Executive Order 12580. Information supporting the decisions leading to the selected remedy is contained in the Administrative Record file for the site.

1.3 ASSESSMENT OF THE SITE

The selected final remedy in this ROD is necessary to protect the public health and the environment from potential releases of hazardous substances into the environment from the Bldg. 284 Site[1] and Former Bldgs. 80 and 302 Site. A human health risk evaluation and an ecological screening risk assessment concluded that a release might present an endangerment to public health or welfare and the environment. Therefore, implementation of LUCs and LTMM of the protective surface covers (i.e., vegetative soil caps, rip-rap revetment, and gravel covered and paved areas) at Bldg. 284 and Former Bldgs. 80 and 302 is required to prevent potential exposure to contaminated soil. In addition,

[1] Text in blue font identifies where detailed site information is available via hyperlink while viewing this ROD in portable document format (PDF). The detailed information is viewable by clicking on the blue text within the PDF. In the event of any inconsistency between the text in this ROD and the text in any of the included hyperlinks, the text in this ROD will take precedence.

long-term monitoring of groundwater will be conducted at the Bldg. 284 Site due to its close proximity to Pearl Harbor.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The LUCs will be maintained in perpetuity to protect human health and the environment by preventing potential exposure to contaminated soil and preventing the erosion of fill material into Pearl Harbor. The combination of LUCs and LTMM will ensure that the sites remain protective of human health and the environment over time.

- The LUC Work Plan (WP) (Earth Tech 2008) documents the engineering and institutional controls designed to (1) restrict land use to prevent development or digging activities and (2) ensure the long-term viability of the final remedy. The elements of the selected remedy are detailed in the WP. Please note that the LUC WP represents the Remedial Action WP, which is a primary document under the PHNC Federal Facilities Agreement (EPA, State of Hawaii, and DON 1994).

The remedy has been selected based on the following:

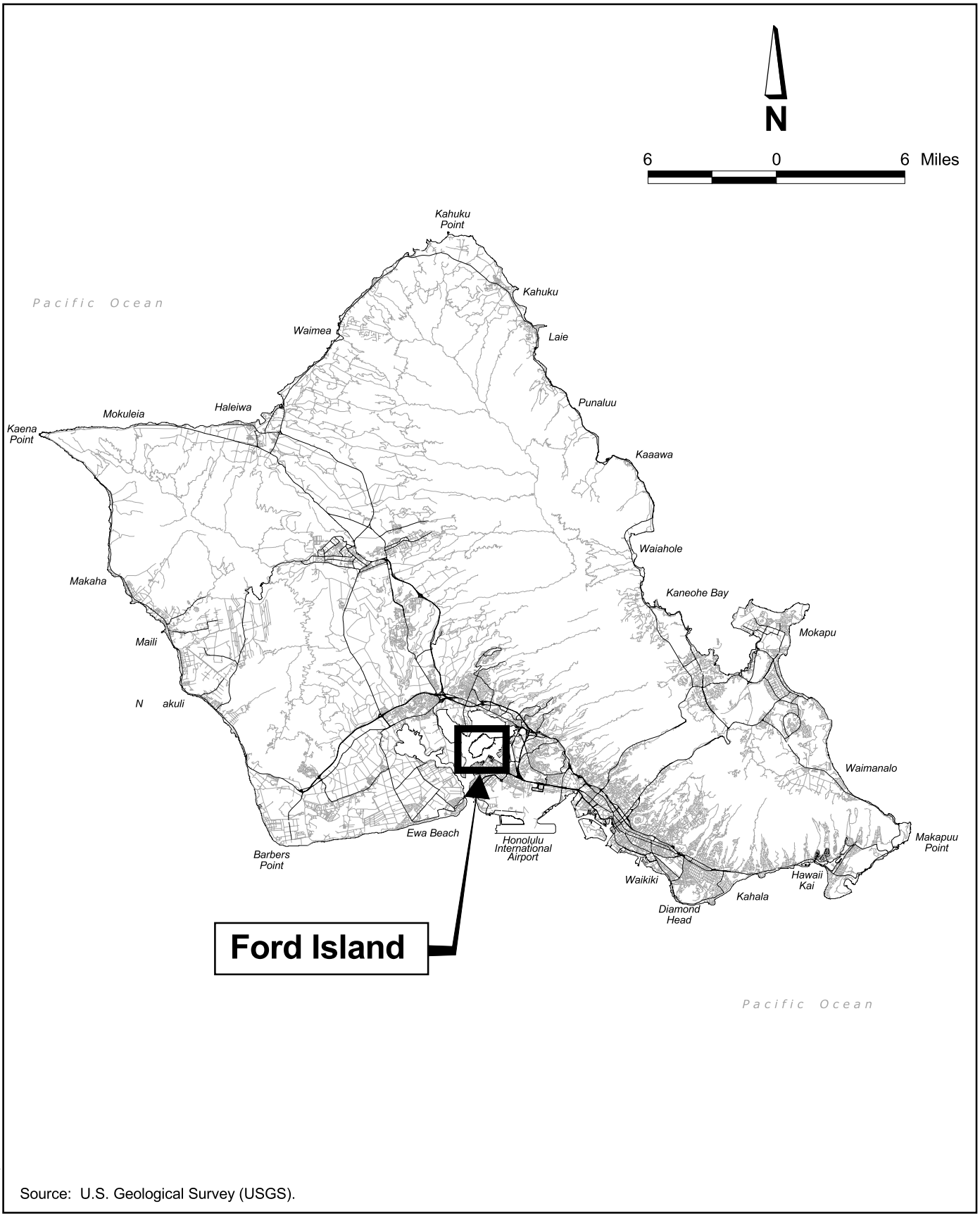
- Previous investigation results
- Results from time-critical removal actions (TCRAs) conducted at both sites that included the construction of the vegetated soil caps and construction of the rip-rap revetment shoreline protection at the Bldg. 284 Site
- Results of focused feasibility studies (FFSs) (Earth Tech 2007a,b) conducted for the two sites.

During previous investigations, the extent of contamination in surface and subsurface soil was delineated, and the data collected indicated that the underlying groundwater had not been impacted and the potential for leaching of chemicals of concern (COCs) to groundwater was unlikely. During the TCRAs, contaminated soil and debris (i.e., concrete and metal) were removed and placed underneath vegetated soil caps constructed over areas containing contaminated surface soil to prevent human and ecological receptors from direct contact with the contaminated media. During the FFSs, existing site risks and features (i.e., vegetated soil caps, asphalt paved areas, building structures, and gravel parking areas) were evaluated and incorporated in the final remedy selected for the site as documented in this ROD. Due to the proximity of the Bldg. 284 Site to Pearl Harbor, additional groundwater monitoring will also be conducted to ensure COCs are not transported to Pearl Harbor via groundwater.

The inspection and reporting requirements described in the LUC WP will be effective immediately upon approval by the EPA, with concurrence from the DOH. Once put into effect, the requirements set forth in the LUC WP will remain applicable to all areas within the LUC boundaries at these two sites during Navy ownership, and all subsequent ownership of these two sites.

The Navy will retain ownership of these sites for the foreseeable future. Restrictions for these sites will remain in effect in perpetuity. If land ownership changes in the future, language will be included in the deed to place restrictions and conditions on the use of the sites. Notification and restrictions for these sites will remain in effect after any future land ownership transfer. The specific LUCs for the Former Bldgs. 80 and 302 Site are discussed in Section 2.4.5.2.

The deed or other instrument for any ownership transfer of the property shall also require the transferee/subsequent landowner to perform annual reviews to ensure compliance with the LUCs that are in place.



Source: U.S. Geological Survey (USGS).

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LAYOUT: L001_61TCRA_no2_Figure 1
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Figure 1
Ford Island Location Map
Record of Decision
Building 284 and Former Buildings 80 and 302
Ford Island, Pearl Harbor, Hawaii

Pearl Harbor

Admiral Bernard Clarey Bridge

Pearl Harbor

Former Buildings 80 and 302

Building 284 Site

LEGEND

Site location

SOURCE

1. OHM Remediation Services, Inc. Dec 1998
2. Shaw Environmental, Inc. Feb 2005
3. R.M. Towill Corp. 1999.
4. ControlPoint Surveying, Inc. August 2000.

N

600 300 0 600 Feet

Figure 2
Site Location Map
Record of Decision
Building 284 and
Former Buildings 80 and 302
Ford Island, Pearl Harbor, Hawaii

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1.5 STATUTORY DETERMINATIONS

The selected remedy for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site is protective of human health and the environment, complies with all applicable or relevant and appropriate requirements (ARARs), is cost-effective, and uses permanent solutions and alternative technologies to the maximum extent practicable.

The removal actions were consistent with cleanup objectives to prevent direct contact or ingestion of contaminated soil and prevent the migration or relocation of contaminated soil to areas where human or ecological exposure could occur. The vegetative soil caps, stone rip-rap revetment and gravel and paved parking areas, and existing building structures help prevent direct contact with contaminated soil and reduce the mobility of pollutants and the likelihood they will further impact the environment. Although previous investigation data indicate that it is unlikely that COCs will adversely affect groundwater, additional groundwater monitoring at Bldg. 284 will ensure that the COCs do not migrate to Pearl Harbor via groundwater. The final remedy of contaminated media will not satisfy the statutory preference for treatment as a principal element of the final remedy.

Because this remedy results in hazardous substances, pollutants, or COCs remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the selected final remedy, as required under CERCLA Section 121(c), 42 United States Code (U.S.C.) Section 9621(c), and NCP (40 Code of Federal Regulations [CFR] Section 300.430(f)(4)(ii)). The Five-Year Review will be performed to ensure that the LUCs remain protective of human health and the environment over time.

1.6 DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD (Section 2). Additional information can be found in the Administrative Record file for this site.

- COCs and their respective concentrations (Section 2.2.4 for the Bldg. 284 Site and Section 2.3.4 for the Former Bldgs. 80 and 302 Site)
- Summary of ecological and human health risks (Section 2.2.6 for the Bldg. 284 Site and Section 2.3.6 for the Former Bldgs. 80 and 302 Site**)**
- Principal threat wastes (Section 2.4.4)
- Current and reasonably anticipated future land use assumptions (Section 2.2.5 for the Bldg. 284 Site and 2.3.5 for the Former Bldgs. 80 and 302 Site)
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Section 2.4.5.5)
- Estimated capital costs; annual operation and maintenance costs; and total present-worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.4.5.4**)**
- Key factors that led to selecting the remedy (Section 2.4.5.1)

If contamination posing unacceptable risks to human health or the environment is discovered after execution of this ROD, the Navy will undertake all necessary actions to ensure continued protection of human health and the environment.

1.7 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF FINAL REMEDY

The Navy and EPA, with concurrence from the DOH, jointly select LUCs as the final remedy for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. The final remedy for the Bldg. 284 Site includes LUCs, maintenance and inspection of the cap, and long-term monitoring of groundwater. The final remedy for the Former Bldgs. 80 and 302 Site includes LUCs and maintenance and inspection of the cap. This remedy is protective of human health and the environment. In accordance with CERCLA requirements, Five-Year Reviews will be necessary to ensure that the selected final remedy remains protective of human health and the environment at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site, Ford Island, Pearl Harbor Naval Complex, Oahu, Hawaii.

8/27/09

Aaron Y. Poentis
Regional Environmental Program Manager
By direction of: Commander, Navy Region Hawaii

Date

9/29/09

Michael Montgomery
Assistant Director, Federal Facility and Site Cleanup Branch
Superfund Division, U.S. EPA Region 9

Date

The State of Hawaii DOH concurs with the selected remedy as documented in this Record of Decision.

9-30-09

Keith Kawaoka, D. Env.
Program Manager
Hazard Evaluation and Emergency Response Office
State of Hawaii, Department of Health

Date

2. Decision Summary

Section 2.1 provides general information regarding Ford Island and pertaining to the decision summary for both the Bldg. 284 Site and Former Bldgs. 80 and 302 Site. Specific information regarding the decision summary for the Bldg. 284 Site and Former Bldgs. 80 and 302 Site is presented in Section 2.2 and Section 2.3, respectively, and information pertaining to the alternatives evaluation and the selected alternative is presented in Section 2.4.

2.1 FORD ISLAND

2.1.1 Location and Description

Ford Island encompasses approximately 450 acres and is located on the PHNC, on the southern coast of Oahu. As described in Section 1.1, PHNC is identified on the NPL as EPA CERCLIS No. HI4170090076. Executive Order 12580 authorizes DON as the lead agency to conduct environmental response actions at Navy sites such as the Bldg. 284 Site and Former Bldgs. 80 and 302 Site on Ford Island. EPA and DOH have provided oversight during environmental investigations and remediation activities at the Bldg. 284 Site and Former Bldgs. 80 and 302 Site.

Ford Island is approximately 1.25 miles long and 0.62 miles wide. Access to the island is provided by the Admiral Bernard Clarey (Ford Island) Bridge, which spans the channel between the island and the eastern shore of Pearl Harbor (Figure 2).

Ford Island was previously used as a military air station and provided moorage and support to most of the Pacific Fleet. Ford Island is presently used for administration, storage, operational, training, and maintenance activities. The island also provides housing and recreational facilities for Navy personnel. Approximately 3,100 people live or work on Ford Island. The island is undergoing redevelopment for base housing, recreational sites, and other commercial and industrial facilities.

2.1.2 Ford Island History and Enforcement Activities

2.1.2.1 FORD ISLAND HISTORY

Military development of Pearl Harbor and Ford Island began around 1912, and the Naval Air Station (NAS) Ford Island and Army Air Station (AAS) Luke Field were established on the island by 1917. Hangar and support facilities on the southwest side of the island were developed for the AAS, while similar structures on the southeast side of the island were constructed for the NAS. In addition, a row of 22 housing structures, located along the northwest shore of the island, as well as several housing structures and a bachelor's quarters on the northeast tip of the island, were constructed to accommodate the expanding number of naval personnel on-island. An unpaved runway was also constructed for the Army and Navy shared use. Nine 225,000-gallon aboveground storage tanks (ASTs), with secondary containment, were located in the east-central portion of the island from 1924 to 1954.

Ford Island underwent further development and expansion in the 1930s and 1940s. Efforts to expand the island by filling shallow zones along the east and north shores with dredged material from the harbor channel, increased the size of Ford Island by nearly 20 percent. The central portion of the island was cleared and paved for installation of a 4,000-foot runway, and all but two of the original AAS hangars were demolished in favor of open aircraft parking areas, maintenance facilities, and larger hangars. An area near the western shoreline, which later developed into the Ford Island Landfill, was used as a disposal and burn area. During this time, an underground storage tank (UST) farm was installed in the east-central portion of the island with an extensive underground aviation gasoline (AVGAS) pipeline system to distribute fuel. Bunkers for ordnance storage were built on the

north and east sides of the island, the fill area near the north shore, the northeast shore, and the east end of the runway.

Following World War II, the use of Ford Island as a military air station ceased with the advent of jet aircraft. Naval Station assumed ownership of the island when the NAS was deactivated in 1962, and the island was given status as a National Historic Landmark in 1964. The airfield was leased to the State of Hawaii Department of Transportation for limited use by civilian aircraft, however since the state opened Kalaeloa Airport (formerly NAS Barbers Point) in mid-1999, the airfield has remained inactive. Access to the island was improved by construction of the Admiral Bernard Clarey (Ford Island) Bridge in 1998. Ford Island currently hosts several major tenants or commands and provides housing and recreational facilities for Navy personnel. PHNC controls the waters of Pearl Harbor and the adjacent land areas, including Ford Island.

2.1.2.2 SUMMARY OF PREVIOUS INVESTIGATIONS ON FORD ISLAND

The Bldg. 284 Site and Former Bldgs. 80 and 302 Site have been the subject of the following environmental investigations:

Initial Assessment Study. In 1983, the Naval Energy and Environmental Support Activity conducted an initial assessment study (IAS) at PHNC. The IAS report (NEESA 1983) identified potentially contaminated sites at PHNC and recommended further investigation to determine the nature and extent of contamination and develop recommendations for further action.

Site Summary Report. A site evaluation of Ford Island was performed in 1998 to identify and classify sites with suspected environmental contamination. Results of the site evaluation were presented in the *Site Summary Report (SSR), Ford Island Geographic Study Area* (Earth Tech 1998). Investigators systematically evaluated the entire island to identify sites where historic activities may have resulted in the release of hazardous substances or petroleum products. Information was obtained through record searches, interviews with current and former employees, and visual site inspections.

Based on analysis of the available data, eight hazardous substance sites, 55 transformer sites, and four inactive AVGAS pipeline sites were classified as areas that had not been evaluated or required additional evaluation because hazardous substances or petroleum were known to have been stored or used there and may have been released to soil, sediment, surface water, and groundwater.

Remedial Investigation. From 1999 to 2003, a remedial investigation (RI) was conducted to characterize the nature and extent of contamination at the eight hazardous substance sites, 55 transformer sites, and four inactive AVGAS pipeline sites and recommend further action, as necessary, to protect human health and the environment. Soil, sediment, and groundwater samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, herbicides, and metals (Earth Tech 2003c).

Removal actions for the four inactive AVGAS pipeline sites are documented in the *Remediation Verification Report, Non-Time Critical Removal Action, Ford Island Inactive AVGAS Pipeline, Pearl Harbor Naval Complex, Hawaii* (Shaw 2004). Of the 55 transformer sites, 23 required non-time-critical removal actions (NTCRAs) that were conducted between 2003 and 2004 and are documented in the *Remediation Verification Report, Thermal Desorption Treatment of PCB Contaminated Soil, Various Navy Transformer Sites, Oahu, Hawaii* (ECC 2007). The other 32 transformer sites and five of the eight hazardous substance sites that are recommended for no further action are addressed in another Ford Island ROD.

The other three hazardous substance sites are the subject of this ROD and include the Bldg. 284 Site and former Bldgs. 80 and 302, which have been combined due to their close proximity and are referred to as the Former Bldgs. 80 and 302 Site. Several metals of concern were identified in soil samples taken in the vicinity of the Bldg. 284 Site and a soil cleanup was recommended. Although metals concentrations above background levels were detected in subsurface soil, no further action was recommended for the Former Bldgs. 80 and 302 Site because the site was covered with asphalt pavement or a concrete foundation, which prevent direct exposure to the underlying soil.

Engineering Evaluation/Cost Analysis. An engineering evaluation/cost analysis (EE/CA) was prepared as part of a NTCRA for hazardous substance sites on Ford Island to mitigate potential threats to human health and the environment (Earth Tech 2003a). The EE/CA recommended removal actions for five of the hazardous substance sites, including a portion of the Bldg. 284 Site located adjacent to Bldg. 284. The removal actions included excavation of contaminated soil and off-island disposal at facilities approved to accept CERCLA- or Toxic Substances Control Act (TSCA)-regulated waste; jet-flushing of contaminated sediment from storm drain lines at two sites and off-island disposal of the sediment at a facility approved to accept CERCLA-regulated waste, and the cleaning and closure of two oil-water separators at Bldg. 284.

Action Memorandum for Non-Time Critical Removal Action. The decision to conduct a NTCRA at the five hazardous substance sites evaluated in the EE/CA was documented in an Action Memorandum (DON 2003a,b). The removal action included excavation of contaminated soil from the area adjacent to Bldg. 284 and off-island disposal at a CERCLA-approved disposal facility.

Removal Action and Final Remediation Verification Report. Based on recommendations provided in the EE/CA, NTCRAs were conducted at five Ford Island Hazardous Substance Sites, including the Building 284 Site. The June 2003 to October 2003 Bldg. 284 Site NTCRA included soil removal and closure of two oil-water separators (Shaw 2003). Soil was removed from the area immediately adjacent to Bldg. 284 until contaminant concentrations in confirmation samples were below soil cleanup levels. However, confirmation sampling results indicated that metals contamination was present in soil in the sloped area northwest of Bldg. 284 and the contaminated soil extended beyond the excavation limits (Shaw 2005).

Due to planned redevelopment, additional subsurface soil sampling was conducted at the Former Bldgs. 80 and 302 Site in conjunction with the removal action to further delineate the extent of metals detected during the RI at concentrations above background levels. The additional delineation was conducted to ensure areas with elevated metals concentrations in soil were identified and appropriately managed so that impacted soil would not remain exposed at the land surface as a result of construction activities. Additional sampling results indicated that metals were present to the south of the Former Bldgs. 80 and 302 locations and to the east across Independence Street at concentrations that exceed background levels and EPA Region 9 residential and industrial preliminary remediation goals (PRGs). Additional sampling conducted in conjunction with the removal actions continued until the extent of contamination was delineated to the south and the sampling results were presented in the remediation verification report (Shaw 2005).

Action Memorandums for TCRAs. TCRAs were conducted at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. Prior to evaluating removal action alternatives for the Former Bldgs. 80 and 302 Site, additional sampling was conducted until the extent of contamination was delineated in the area east of Independence Street. The additional sampling results are documented in action memorandums for the Former Bldgs. 80 and 302 Site (DON 2005a, 2006a,b). The alternatives evaluated and remedies selected are documented in one action memorandum for the Bldg. 284 Site (DON 2005b) and two action memorandums and an action memorandum addendum for the Former Bldgs. 80 and 302 Site (DON 2005a, 2006a,b). The action memorandum for the Bldg. 284 Site

documented the decision to construct a vegetative soil cap and shoreline protection including a rip-rap revetment. The action memorandums and action memorandum addendum for the Former Bldg. 80 and 302 Site documented the decision to conduct soil removal to facilitate planned construction activities, "hot spot" surface soil removal, and construction of a vegetative soil cap.

Performance Design Packages. Performance design packages were prepared for the TCRA at the Bldg. 284 Site (Earth Tech 2006b) and Former Bldgs. 80 and 302 (Earth Tech 2006a,c). The performance design packages provided detailed designs for the vegetative soil cap and the rip-rap revetment shoreline protection at the Bldg. 284 Site and the vegetative cap at the Former Bldgs. 80 and 302 Site.

Remediation Verification Reports for TCRAs. Based on recommendations provided in the action memorandums for the TCRAs (DON 2005a,b 2006a,b) and the specifications provided in the performance design packages (Earth Tech 2006a,b,c), TCRAs were completed at the Bldg. 284 and the Former Bldgs. 80 and 302 Sites. Details regarding the activities conducted during the TCRAs are presented in the remediation verification reports (Dawson 2007a,b). The TCRA at the Bldg. 284 Site was conducted from July 2006 to September 2006 and included consolidation of construction debris along the Pearl Harbor shoreline and construction of a vegetative cap and rip-rap shoreline protection. The TCRA conducted at the Former Bldgs. 80 and 302 Site was conducted in two phases. The first phase was conducted from December 2005 to March 2006 to accommodate construction of a planned Pacific Warfighting Center. The second phase was conducted from June 2006 to December 2006 and included hot spot surface soil removal and construction of a vegetative cap in the area east of Independence Street.

Focused Feasibility Studies (FFSs). A FFS was conducted in July 2007 for the sloped area at the Bldg. 284 Site (Earth Tech 2007a) and in September 2007 for the Former Bldgs. 80 and 302 Site (Earth Tech 2007b). The studies recommended LUCs and LTMM as the final remedy for both sites.

Proposed Plan. In 2008, a proposed plan (PP) was prepared for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site to present the recommended final site remedy and to facilitate public involvement in the remedy selection process. The PP (DON 2008) presented the various alternatives considered, identified LUCs and LTMM as the recommended alternative, explained the rationale for selecting the alternative, and requested public comment.

2.1.2.3 Enforcement Activities

There have been no enforcement activities at the Bldg. 284 Site or the Former Bldgs. 80 and 302 Site.

2.1.3 Community Participation

Public participation in the decision process for environmental activities at Ford Island has continually been encouraged throughout the environmental restoration and site closure processes. In an effort to involve the public in the decision-making process, a Restoration Advisory Board (RAB) was established. The RAB is composed of the DOH, the EPA, the Navy, and community representatives. The Navy has held RAB meetings (typically on a semi-annual basis) and other public meetings, as well as issued fact sheets that summarize the site investigation and cleanup activities. The RAB team has provided review and comment leading to the selection of the final remedy in this ROD. Additionally, the Navy also established a point-of-contact for the public in the NAVFAC Hawaii.

The PP formally presented the selected remedy to the public and solicited public comment. A public meeting for the PP was held on 5 March 2008 at the Aiea Public Library. The public comment period for the PP was held between 25 February 2008 and 25 March 2008.

Throughout the investigation process, the Navy has prepared several fact sheets to inform and update the community on the progress of Ford Island environmental investigation and cleanup activities. These fact sheets and other project documents, including work plans, technical reports, and other materials relating to the Ford Island investigation activities, can be found in the information repositories at the following addresses:

Aiea Public Library
91-143 Moanalua Road
Aiea, Hawaii 96701
(808) 483-7333

Pearl City Library
1138 Waimano Home Road
Pearl City, Hawaii 96782
(808) 453-6566

Hamilton Library at the University of Hawaii at Manoa
Hawaiian and Pacific Collection
2550 McCarthy Mall
Honolulu, Hawaii 96822
(808) 956-8264

Additional project information is located in the Administrative Record file located at Naval Facilities Engineering Command, Pacific in Pearl Harbor. The address for the Administrative Record file is provided below:

Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
Attn: NAVFAC PAC EV4
Pearl Harbor, Hawaii 96860-3134

2.1.4 Scope and Role of the Response Action

The Bldg. 284 Site and the Former Bldgs. 80 and 302 Site are located on Ford Island, which is within the PHNC. The PHNC is listed on the NPL, which identifies priorities among known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The Navy and the EPA, through a Federal Facilities Agreement (EPA, State of Hawaii, and DON 1994), and with concurrence from the DOH, have agreed to

- Ensure that environmental impacts associated with past and present activities are thoroughly investigated and that appropriate remedial actions are taken, as necessary, to protect public health, welfare, and the environment
- Establish a procedural framework and schedule for developing, implementing, and monitoring appropriate remedial actions in accordance with CERCLA, SARA, NCP, Superfund guidance and policy, Resource Conservation and Recovery Act (RCRA) guidance and policy, and applicable State of Hawaii law

- Facilitate cooperation, exchange of information, and participation between the Navy, EPA, and the DOH
- Ensure adequate assessment of potential injury to natural resources to ensure the implementation of remedial actions appropriate for achieving suitable cleanup levels

2.1.4.1 PAST RESPONSE ACTIONS

Additional delineation at the Bldg. 284 Site and Former Bldgs. 80 and 302 Site was conducted in conjunction with the NTCRA conducted in 2003. The delineation sampling indicated that the extent of metals contamination in soil extended along the entire sloped area at Bldg. 284 and south and east of the remaining concrete foundations for the former Bldgs. 80 and 302.

After delineating the extent of contamination, TCRAs were conducted at the two sites between 2005 and 2006. The TCRAs were conducted to prevent potential exposure of human and ecological receptors to contaminated soil and included the following:

- Soil removal and off-island disposal
- The removal and placement of debris and contaminated surface soil in areas over which vegetative soil caps were constructed
- Construction of rip-rap revetment shoreline protection and installation of groundwater monitoring wells at Bldg. 284.

2.1.4.2 SELECTED RESPONSE ACTION

A response action is necessary to protect human health and the environment from exposure to contaminants remaining in soil at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. Due to the wide extent and large estimated volume of impacted soil at the sites, the objectives of the previous NTCRA and TCRAs were to eliminate pathways between contaminated media and potential human and ecological receptors without removing contaminated media from the sites. The response action, which prevents direct exposure to metals contaminated subsurface soil while leaving contamination in place, will effectively reduce risks to human health and the environment and continue to do so as long as the protective surface covers within LUC boundaries (vegetative soil caps, rip-rap revetment, gravel areas, paved areas, and existing building structures) are maintained. LUCs and LTMM will insure that human health and the environment are protected in perpetuity. In addition, long-term monitoring of groundwater at the Bldg. 284 site will ensure that COCs are not transported to Pearl Harbor via groundwater.

2.1.5 Ford Island Site Characteristics

2.1.5.1 TOPOGRAPHY

With the exception of the northeast corner of the island, the land surface of Ford Island is generally less than 20 feet above mean sea level (msl). In the northeast corner of the island, the land surface rises to over 27 feet above msl. The highest elevations occur along a line running from the northeast to southwest corners of the island.

2.1.5.2 WILDLIFE AND SENSITIVE ECOSYSTEMS

Details regarding biological resources on Ford Island are discussed in the RI Report (Earth Tech 2003c). Buildings and vegetation on Ford Island may be used as refuge by common urban species, such as the house mouse, mongoose, Norway and black rats, house sparrow, Java sparrow, and common mynah. The paved and industrial areas of Ford Island have little habitat value.

The birds that frequent the nearby wildlife refuges are the most important form of wildlife at PHNC. Four federally listed endemic and endangered wading birds and waterfowl are associated with these refuges: the Hawaiian stilt, Hawaiian gallinule, Hawaiian coot, and Hawaiian duck.

The endemic short-eared owl, state-listed as endangered on Oahu, has been observed hunting in the area. In addition, 28 other bird species, including indigenous, migratory, and exotics, are found on the Pearl Harbor refuges and surrounding areas.

Common fish at the refuges include the mullet (*Mugil* sp.) and the awa (*Chanos chanos*) (Nakai 1997). The quiet waters in the upper regions of all the Pearl Harbor lochs surrounding Ford Island provide excellent habitat for the Hawaiian anchovy (*nehu*) (*Encrasicholina purpurea*), a species used as a baitfish in the offshore tuna (*aku*) fishery. This species is the most important baitfish resource in Hawaii, and Pearl Harbor represents an important spawning ground (Smith 1993; Somerton 1989). The green sea turtle (*honu*) (*Chelonia mydas*) is a threatened indigenous reptile that is occasionally observed within Pearl Harbor.

2.1.5.3 CULTURAL RESOURCES

A summary of the information regarding archaeological resources and the historic buildings and structures on Ford Island is provided below.

Prehistoric and Historic Archaeological Resources. Very little specific information is available regarding how Ford Island was used in the pre-contact and early post-contact periods. Given the island's lack of water, there may have been little pre-contact habitation, except short-term occupation for fishing, collecting pili grass, and possibly seasonal cultivation of dryland crops such as gourd and sweet potato.

There are no known archaeological sites on Ford Island. A review of site potential (Earth Tech 2003c) suggests that sugarcane cultivation and military construction destroyed any sites that may have existed, except for what might be buried in limestone sinkholes or caves. Despite the extensive construction that has occurred on Ford Island, no human remains or subsurface archaeological sites have been reported on the island.

Historic Buildings and Structures. Ford Island is located within the boundaries of the Pearl Harbor National Historic Landmark (PHNHL). The island currently has 154 historic buildings and structures that are deemed contributing properties to the PHNHL. Historic resources on Ford Island represent military development of the Navy and Army in Hawaii spanning two world wars.

2.1.5.4 GEOLOGY

The geological materials that compose Ford Island include fill material, volcanic material, lagoonal deposits, and coralline deposits. The fill material, consisting of mixtures of gravels, sands, silts, and clays, appear to be thickest where the shoreline has been reclaimed and thinnest where tuff deposits are near the surface (Munro 1981). The fill material consists primarily of on-island materials, and the nature of fill deposits varies according to its source, placement method, and its compaction. Surface sediments are generally classified as fill material based on composition, consistency, and placement. Changes in the composition, consistency, or placement of the fill material delineate the boundary between fill and in-situ material.

The volcanic material includes tuff (cemented aeolian ash), weathered tuff, and basalt. Weathered tuff primarily includes decomposed tuffaceous rock consisting of stiff to very stiff, silt-sized particles, which were weathered in place or reworked, transported, and redeposited (Munro 1981). Additionally, the weathered tuff includes unoxidized gray clay layers that are thought, in part, to be

of submarine deposition (Wentworth 1951). The weathered tuff is sometimes mixed with coral sand. Basalt underlies the PHNC below msl and beneath hundreds of feet of sediment, according to well records (Stearns and Vaksvik 1938).

The lagoonal deposits include consolidated and unconsolidated deposits of soft or loose silt to clay-sized particles that were formed in low energy environments including lagoons, swamps, estuaries, and drowned streams and channels. These deposits are often mixed with loose materials including sand and coral debris. Unconsolidated lagoonal deposits are highly compressible, having an average soil penetration number of less than four blows per foot, whereas consolidated materials are slightly stiffer (Munro 1981).

Surface soil types on Ford Island are generally classified as silty sands or sandy silts with varying amounts of gravel, owing to the high degree of development and the associated usage of fill material throughout the island. Ford Island itself is classified as coral outcrop (USDA SCS 1972), which consists of coral or cemented calcareous sand. However, many of the characteristics of the surface soil indicate that silt, sand, and graded coral gravel make up much of the fill material. The surface and near surface soils at the hazardous substance sites are predominately varying mixtures of inorganic, low plasticity clays and silts with varying amounts of sand and gravel-sized materials. The sand and gravel are poorly graded and sub-angular. A significant portion of Ford Island is covered by concrete and asphalt, which overlie the fill material.

2.1.5.5 HYDROGEOLOGY

Ford Island is located in the Honolulu–Pearl Harbor basal groundwater aquifer area. The shallow groundwater in the surficial cap rock aquifer beneath Ford Island is encountered at approximately sea level. Shallow groundwater on Ford Island is not used for potable purposes and is not hydraulically connected to the basal aquifer of Oahu, which is approximately 460 feet below ground surface (bgs). A direct correlation exists between changes in shallow groundwater elevation underlying Ford Island and tidal fluctuations. The source of shallow Ford Island groundwater is believed to originate from infiltration of precipitation combined with intrusion of seawater. As a result, the shallow groundwater is generally brackish.

Depth to groundwater at Ford Island ranges from approximately 3 feet bgs in wells located along the shoreline to 19 feet bgs in wells located inland. The surficial cap rock aquifer occurs from the water table to the first underlying aquitard. Its lower limits were not encountered during the RI; however, it is estimated that it is approximately 16 feet thick (Ogden 1995). The aquifer is generally encountered within the weathered volcanic material, coralline debris, and lagoonal deposits.

Groundwater at Ford Island (including the site) is not currently used for drinking water purposes nor is it considered a potential source of drinking water. The shallow caprock groundwater at Ford Island is classified by the DOH as “ecologically important” since it discharges to Pearl Harbor (Mink and Lau 1990). Groundwater classification at Ford Island is discussed in detail in the RI report (Earth Tech 2003c).

2.2 BLDG. 284 SITE BACKGROUND

This section provides site specific details regarding past investigations, removal actions, and risk assessment for the Bldg. 284 Site.

2.2.1 Bldg. 284 Location and Description

The Bldg. 284 Site is located at the southwest corner of Ford Island (Figure 2). A site map for the Bldg. 284 Site is shown on Figure 3. The site contains the vacant Bldg. 284 structure and an adjacent unpaved sloped area northwest of the building. Bldg. 284 is a large concrete building situated on the

Pearl Harbor shoreline. The building includes a concrete deck supported by concrete pillars that extends from the western side of the building over an unpaved shoreline area of Pearl Harbor. The unpaved sloped area, referred to in previous reports as the Bldg. 284 Slope, encompasses approximately 17,250 square feet and slopes steeply towards the Pearl Harbor shoreline. A historic seaplane ramp and a historic concrete pier with associated mooring, and one existing building (Bldg. 255) are located at the north end of the site. The site is bordered to the southeast by the concrete foundation of a former aircraft engine testing facility (Bldg. 8). The areas to the north, east, and south of the Bldg. 284 Site are covered with concrete.

2.2.2 Bldg. 284 History and Potential Sources of Contamination

2.2.2.1 Site History

The Site Summary Report for Bldg. 284 (Earth Tech 1998) indicated that it was built in 1946 and is a former aviation engine test cell facility. Northwest of Bldg. 284 and the sloped area is the Ford Island Landfill. The unpaved sloped area contained exposed metal and concrete construction debris. Bldg. 284 and the unpaved sloped area are hereinafter referred to as the Bldg. 284 Site, unless specific differentiation between the two areas is required for clarification.

The remains of Structure S362, the Pan Am Clipper seaplane ramp, and a historic structure are located along the shoreline. Bldg. 255, located in the northeast portion of the site at the top of the slope, is also a historic structure, which was built prior to 1942 and housed an electronic transmission operating station; currently, it houses the active transformer TB-01. In addition, former Bldg. 294, built in 1942, was located adjacent to the northern portion of the area and served as an AVGAS pumping station. One UST at the site and five USTs approximately 70 feet away on the east of the site were removed in the late 1990s.

A review of the shoreline shown on historical aerial photographs in the *Environmental Baseline Survey, Ford Island Geographic Study Area* (Earth Tech 2003b) suggests that fill material was placed along the shore sometime between 1942 and 1952. A 1942 aerial photograph indicates that the shoreline was located northeast of its present location; whereas, a 1952 photograph shows a shoreline matching the present location. The Ford Island Landfill was in operation during this 10-year period and received bulk debris reportedly including scrap metal, concrete rubble, and miscellaneous debris (Ogden 1995). Debris observed along the Bldg. 284 Slope site appears to be similar to some of the debris that reportedly exists within the Ford Island Landfill.

2.2.2.2 Potential Sources of Contamination

There is no record of a water collection or treatment system at the Bldg. 284 Site; therefore, the potential existed for waste to discharge directly into the surrounding soils. The debris observed at the sloped area appeared to be similar to some of the debris reportedly existing within the Ford Island Landfill. In addition, there are documented historical releases from several nearby USTs and an aviation fuel pipeline.

2.2.3 Bldg. 284 Previous Investigations and Removal Actions

2.2.3.1 UST Removals (October 1996 – February 1997)

Five USTs (NSFI-78 through NSFI-82), which were formerly located approximately 70 feet east of the Bldg. 284 Slope site, were removed between October 1996 and February 1997. After the USTs were removed, several soil samples and one groundwater sample were collected and analyzed to investigate potential contamination associated with the USTs. The soil samples were analyzed for total petroleum hydrocarbons (TPH) as gasoline range organics (GRO); TPH as lube oil range organics (LRO); benzene, toluene, ethylbenzene, and xylenes (BTEX); VOCs; polynuclear aromatic compounds (PAHs); PCBs; and total cadmium and lead. The groundwater sample was analyzed for

TPH-LRO and TPH-GRO. Analytical results indicated that soil concentrations of TPH-LRO and TPH-GRO exceeded action levels, indicating that a release had occurred. Limited over-excavation of soil was performed to remove the fuel-related soil contamination. Subsequently, a monitoring well was installed in August 1998 and a groundwater sample was collected and analyzed for TPH as diesel range organics (DRO), TPH-LRO, BTEX, PAHs, total lead, and total dissolved solids to evaluate the potential impact on groundwater.

No COCs were detected in the groundwater at concentrations above DOH Tier 1 Action Levels (Hawaii Administrative Rules [HAR] 11-281-80.1); therefore, no further action was recommended for the site (OHM 1998a).

UST NSFI-90 was located within the northern portion of the site, approximately 65 feet from the west corner of Bldg. 255, and was removed in 1997. Confirmation soil samples were collected from the excavation and analyzed for TPH-GRO, -DRO, and -LRO; BTEX; total lead; and toxicity characteristic leaching procedure (TCLP) arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The analytical results indicated that total lead concentrations exceeded the DOH Tier 1 Soil Action Level for lead (400 milligrams per kilogram [mg/kg]). Over-excavation and additional sampling indicated that the tank was not the source of contamination; however, a monitoring well was installed and groundwater was sampled for TPH-GRO, BTEX, and total lead to further assess potential impacts to groundwater. No COCs were detected in the groundwater at concentrations above DOH Tier 1 Action Levels (HAR 11-281-80.1); therefore, no further action was recommended for the site (OHM 1998b). Additional investigation was conducted in December 2005 to further evaluate the presence of petroleum COCs at the site. The December 2005 sampling results indicated that elevated concentrations of lead were detected in soil and groundwater; however, based on the data obtained it was concluded that the presence of lead was not likely attributable to the UST. Therefore, the lead contamination found at the UST site is attributed to the Bldg. 284 Installation Restoration (IR) site, which has been transferred from the DOH Solid and Hazardous Waste Branch, UST Section to the DOH Hazard Evaluation and Emergency Response Office. All future activities and monitoring will be conducted under the Navy IR Program.

2.2.3.2 FORD ISLAND REMEDIAL INVESTIGATION (APRIL 2000)

Monitoring wells (B284-MW01 through B284-MW04) were installed in four soil borings advanced around Bldg. 284 during April 2000 as part of the Ford Island RI (Earth Tech 2003c). Well B284-MW01 was located on the north side of Bldg. 284 and nearest the Bldg. 284 Slope site. Surface and subsurface soil and groundwater samples collected from the borings and monitoring wells were analyzed for VOCs, SVOCs, TPH-GRO, TPH-DRO/LRO, and Target Analyte List metals. The groundwater samples were also analyzed for total dissolved solids and chlorides.

Results of a human health preliminary risk evaluation (PRE) and ecological screening risk assessment (SRA) indicated that metals in surface and subsurface soil at the well B284-MW01 location (within an unpaved area on the north side of Bldg. 284) posed unacceptable health risks to human and terrestrial ecological receptors. Results of the risk assessment are presented in the Ford Island RI report (Earth Tech 2003c). The metals of concern were arsenic, beryllium, cadmium, lead, mercury, and selenium. Therefore, a soil removal action was recommended for the area immediately adjacent to Bldg. 284.

Soil and groundwater at other areas of the Bldg. 284 investigation site were determined to be safe for humans and terrestrial and aquatic animals and plants.

In addition to the samples collected during the Bldg. 284 investigation, five composite surface soil samples (each consisting of two samples from separate locations) were collected around Bldg. 255,

and four concrete wipe samples were collected from within the concrete-paved area in front of the building. The samples were analyzed for PCBs as congeners to assess potential releases associated with transformer TB-01. The analytical results indicated the total PCB concentrations for all analyses were below the TSCA high-occupancy screening criteria of 1 mg/kg for soil and 10 micrograms per 100 square centimeters for concrete surfaces. Therefore, no further action was recommended for the transformer TB-01 site (Earth Tech 2003c), which is being addressed in another Ford Island ROD.

Shoreline sediment adjacent to the Bldg. 284 Slope site may also be contaminated but was not sampled during the Ford Island RI. This shoreline area is being addressed as part of a larger, separate Pearl Harbor Sediment Study being conducted by the Navy under CERCLA authority.

2.2.3.3 Removal Action at Building 284 (June 2003 to October 2003)

Based on the recommendations presented in the Ford Island RI (Earth Tech 2003c), a NTCRA was conducted from June 2003 through October 2003 to address metals contamination detected in soil on the north side of Bldg. 284 (Figure 3). The objective of the removal action was to remove soil contaminated with metals at concentrations that posed unacceptable risks to human and ecological receptors in the vicinity of northwest corner of Bldg. 284 and to replace the excavated soil with clean fill material.

Approximately 204 tons of metals-impacted soil were removed and disposed of off-island. The excavation was approximately 60 feet by 30 feet and between 5 and 9 feet deep. Results of confirmation sampling conducted within the excavation area indicated average exposure concentrations were safe for human and ecological receptors, and no further action was recommended for the area immediately adjacent to Bldg. 284. In addition, three monitoring wells installed during the RI (including well B284-MW01) were abandoned, and two abandoned oil–water separators at Bldg. 284 were clean-closed. In closing the two oil-water separators, 1,220 gallons of residual liquids were removed via vacuum truck, and approximately 50 gallons of sludge were excavated from the vaults. The vaults were then pressure-washed and backfilled with clean gravel. All liquid and sludge wastes were drummed and disposed of off site at Clean Harbors (a facility approved to receive CERCLA-regulated waste) in San Jose, CA (Shaw 2005).

During the 2003 removal action, large amounts of metal and concrete debris were observed along the shoreline and unpaved slope area located north of the excavation site. Therefore, additional soil sampling was conducted to investigate potential metals contamination in these areas. Analytical sampling results indicated that soil along the shoreline and unpaved slope contained high levels of arsenic, cadmium, and lead. The maximum concentrations detected during the 2003 removal action for these metals were 512 mg/kg, 33 mg/kg, and 4,960 mg/kg, respectively. The additional sampling effort yielded limited subsurface soil data because the drill rig was unable to penetrate some of the subsurface concrete and metal debris encountered within the shoreline and slope areas.

It was determined that the contamination beyond the limits of the area excavated during the 2003 NTCRA to the north of Bldg. 284 was from a different source than the contamination in the area immediately adjacent to Bldg. 284. The contamination along the slope was primarily attributed to the metal and concrete debris. Further evaluation of the data collected and options for further actions were recommended (Shaw 2005).

2.2.3.4 Removal Site Evaluation (August 2005)

Additional sampling was conducted during a removal site evaluation (RSE) in August 2005 to obtain the data needed to evaluate whether metals in soil could leach to the underlying groundwater at concentrations that would pose unacceptable risks to human or ecological receptors. A summary of the RSE field activities and findings is presented in a technical memorandum (Earth Tech 2007a), which

includes all soil and groundwater sampling results from the August 2005 sampling event. Groundwater samples were collected to evaluate whether groundwater beneath the site has been adversely impacted, and soil samples were collected to evaluate the potential for metals to leach to the groundwater. All samples were analyzed for the site-related metals of concern: antimony, arsenic, beryllium, cadmium, copper, lead, mercury, nickel, and zinc. The groundwater samples were analyzed for total and dissolved metals and general water chemistry parameters. The soil samples were analyzed for total and TCLP metals. Analytical data for the August 2005 characterization sampling indicate that groundwater beneath the site has not been adversely impacted and that metals are not likely to leach from site soils at concentrations that could adversely impact the underlying groundwater.

2.2.3.5 Removal Action at Building 284 Slope Site (July 2006 to September 2006)

To address metals contamination in soil along the Bldg. 284 Slope site, a TCRA was conducted from July to September 2006. The removal action included construction of a permeable and vegetative soil cap and shoreline revetment constructed over the contaminated media to prevent direct exposure to human and ecological receptors and prevent erosion of soil fill into the harbor. The soil cap consists of a geotextile layer overlain with 18 inches of engineered fill and 6 inches of clean top soil. This cap was then revegetated with grass. The revetment was constructed with rip-rap armor stone placed over a geotextile layer along the shoreline.

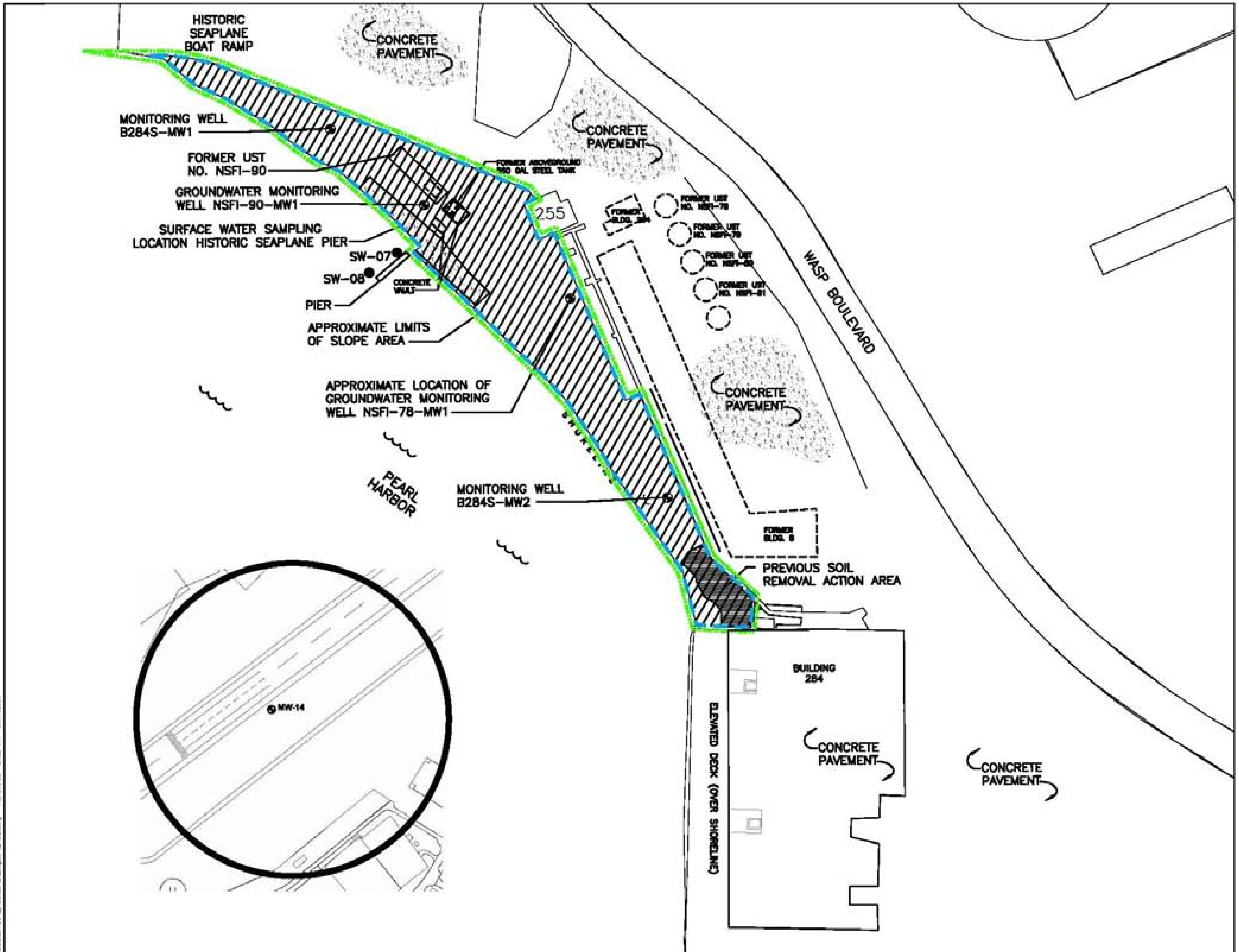
The top casing of two existing groundwater monitoring wells were extended to ensure that they will be accessible for future use. In addition, two additional monitoring wells were installed for use in future groundwater monitoring activities. A summary of the removal action completed for the Bldg. 284 Slope site is provided in the *Final Remediation Verification Report, Removal Action at Building 284 Slope* (Dawson 2007a).

2.2.4 Bldg. 284 Current Site Characteristics

As described in Section 2.2.1, the site is bordered to the south by Bldg. 284, to the northwest by a historic seaplane ramp and the Ford Island Landfill, to the east by concrete pavement, and to the west by Pearl Harbor. The restored slope area contains the soil cap that has been constructed on top of the contaminated soil and debris (i.e., metal, concrete) and is vegetated with a grass cover. The extent of contaminated soil is contained within the LUC boundaries shown on Figure 3. Rip-rap shoreline protection extends along the entire shoreline at the base of the slope. A historic pier is located along the shoreline at the northwest end of the site.

Table 1 summarizes the maximum detected concentrations for site-related COCs during all previous investigations and presents associated Oahu caprock soil background levels, and EPA Region 9 residential and industrial soil PRGs. Oahu caprock soil background levels represent natural and anthropogenic background levels of metals contained in the soils overlying the “caprock” sediments along the Oahu coastal plain, within which Ford Island is located. These caprock sedimentary deposits represent interlayered alluvium, marine sediments and weathered Koolau basalt.

Except for arsenic, the data were screened against the 95th percentile of the Oahu caprock soil background concentration range (Earth Tech 2006d), which were agreed upon by EPA Region 9 and DOH and finalized in 2006. The Oahu caprock soil background concentrations are considered protective of both human and terrestrial ecological receptors on Ford Island. For arsenic, a cleanup level of 17 mg/kg (site average) and 22 mg/kg (maximum concentration), which exceeds the 95th percentile for arsenic, has been established for Ford Island sites. As shown in Table 1, antimony, arsenic, cadmium, copper, lead, mercury, and zinc have been detected in soil at concentrations above their screening criteria.



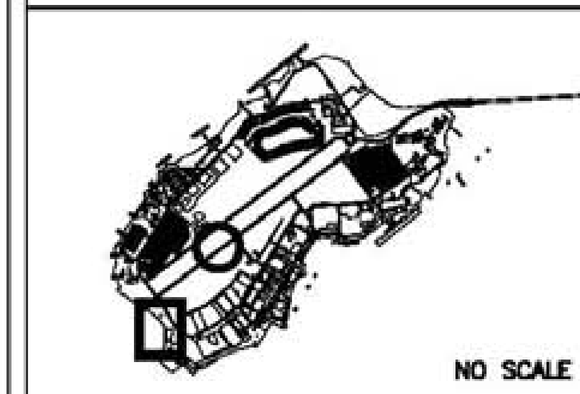
LEGEND

- Existing groundwater monitoring well
- Approximate extent of contamination remaining at site
- Land use control boundary
- Grass covered soil cap
- Previous soil removal action area

SOURCE

1. OHM REMEDIATION SERVICES, INC. DEC 1998
2. SHAW ENVIRONMENTAL, INC. FEB 2005

KEY MAP



NO SCALE

Figure 3
Building 284 Site Map
Land Use Control ROD
Building 284 and
Former Buildings 80 and 302
Ford Island, Pearl Harbor, Hawaii

Table 1: Maximum Detected Metals Concentrations Remaining in Soil after the Removal Action at the Building 284 Slope Site

Metal	Maximum Detected Concentration at Site	Depth of Maximum Detected Concentration Prior to Cap Construction (feet bgs)	Oahu Caprock Soil Background Concentrations (Earth Tech 2006)		EPA Region 9 PRGs (2004)	
			Estimated Background Range	95th Percentile	Residential	Industrial
Antimony	**410**	0–0.5	0.12–8.4	7.3	31	410
Arsenic	**798**	0–0.5	0.21–29	16	0.39	1.6
Beryllium	< 0.002	n/a	0.01–3.3	2.5	150	1,900
Cadmium	**33**	3.5–4.0	0.04–3.0	2.3	37	450
Copper	**676**	0–0.5	1.8–230	110	3,100	41,000
Lead	**4,960**	2–2.5	0.19–40 [a] 0.19–203 [b]	29 [a] 96 [b]	400	800
Mercury	**10.8**	0–0.5	0.0035–0.35	0.29	23	310
Nickel	116	0–0.5	1.64–353	205	1,600	20,000
Selenium	11	4–4.5	0.31–11	9.0	390	5,100
Zinc	**12,700**	0–0.5	1.6–193[c]	166 [c]	23,000	100,000

Site screening criteria include background concentrations for Oahu caprock soil.
Concentrations in **boldface** exceed the 95th percentile of the estimated background range for Oahu caprock soil.
bgs below ground surface
n/a not applicable, beryllium was not detected
[a] Lead from natural background sources only
[b] Lead (Pb) from combined natural/anthropogenic background sources. The anthropogenic Pb background concentration ranges are not intended for direct comparison to site data because anthropogenic Pb background conditions are not controlled by soil type. The Koolau and caprock soil data evaluated for the Environmental Background Analysis represent sites located in developed, populated, and congested areas of Oahu. The distribution of anthropogenic Pb is typically controlled by proximity to anthropogenic sources such as urban development, population, and traffic conditions, not the natural characteristics of the parent rocks. Therefore, these estimated ranges should be used with caution.
[c] Zinc (Zn) background concentrations may be higher, particularly in urban settings, where anthropogenic Zn background sources (primarily automotive-related) are common (De Carlo et al. 2004, 2005).

2.2.5 Bldg. 284 Current and Potential Future Site and Resource Uses

The Bldg. 284 Site slope area contains the soil cap that is vegetated with a grass cover. Rip-rap shoreline protection extends along the entire shoreline at the base of the slope. The site contains a historic pier and is bordered to the north by a historic seaplane ramp and the Ford Island Landfill.

As described in Section 2.1.5.2, no federal- or state-listed threatened or endangered plant or mammal species have been identified at Ford Island. Following its construction, the soil cap was vegetated with Common Bermuda Grass (Dawson 2007a), which is periodically mowed and maintained. The grass habitat at the site may be used as refuge by common urban species, such as the house mouse, mongoose, Norway and black rat, house sparrow, Java sparrow, and common mynah.

The southwest border of the site lies along the quiet waters of Pearl Harbor, which provides habitat for the Hawaiian anchovy. The green sea turtle is a threatened indigenous reptile that is occasionally observed within Pearl Harbor waters (Section 2.1.5.2).

As described in Section 2.1.5.5, groundwater at Ford Island (including the site) is not currently used for drinking water purposes nor is it considered a potential source of drinking water.

2.2.5.1 CURRENT LAND USE

The Bldg. 284 Site structure is currently locked and vacant. The current land use is industrial. The concrete pad adjacent to the Bldg. 284 Site has been used for staging construction equipment. The entire site is accessible to any person on Ford Island except for the building.

2.2.5.2 FUTURE LAND USE

There are plans for housing developments on the west and north sides of Ford Island; however, there are currently no development plans for the Bldg. 284 Site. The anticipated future land use for this site is commercial/industrial.

2.2.6 Bldg. 284 Summary of Site Risks

The post-removal risk assessment was conducted to evaluate potential risks to human and ecological receptors and is presented in the Bldg. 284 FFS (Earth Tech 2007b). A conceptual site model (CSM) was developed to identify all current and future human health and ecological exposure pathways for the Bldg. 284 Site. The Bldg. 284 Slope CSM is included in the post-removal risk assessment (Figure 4).

The human health project screening levels for the COCs at the Bldg. 284 Site were based on EPA Region 9 residential soil PRGs (EPA Region 9 2004), with the exception of arsenic. The screening level for arsenic was 17 mg/kg (site average) and 22 mg/kg (maximum allowable concentration) and established based on recommendations from EPA Region 9 (Earth Tech 2003c).

The 95th percentile of the estimated background range for caprock soils in Oahu served as the ecological screening level for metals in soil.

2.2.6.1 HUMAN HEALTH RISK ASSESSMENT

The human health risk assessment quantitatively focused on the potential for human exposure to remaining subsurface soil at the Bldg. 284 Site. Maximum and reasonable maximum exposure (RME) exposure point concentrations (EPCs) for chemicals of potential concern (COPCs) were compared to the project screening levels and EPA Region 9 residential and industrial PRGs to determine the potential carcinogenic risk and non-cancer hazard estimated for the Bldg. 284 Site under the residential and industrial land use scenarios. The RME EPC was the minimum of either the 95 percent upper confidence limit of the arithmetic mean or the maximum EPC.

The RME EPCs for antimony, arsenic, and lead in subsurface soil exceed their respective human health-based screening levels.

The cumulative maximum and RME carcinogenic risks for subsurface soil are greater than the 1E–06 point of departure for both the residential and industrial land use scenarios. The cumulative maximum and RME carcinogenic risk for soil under an assumed residential land use is 2E–03 and 3E–04, respectively. The cumulative maximum and RME carcinogenic risk for soil under an assumed industrial land use is 5E–04 and 8E–05, respectively. Arsenic accounts for 100 percent of the estimated risk.

The cumulative non-cancer hazards associated with maximum and RME EPCs in subsurface soil exceed the point of departure of 1 for both the residential and industrial land use scenarios. The cumulative non-cancer hazards associated with maximum and RME EPCs for the residential land use scenario were 50 and 20, respectively. The cumulative non-cancer hazards associated with maximum and RME EPCs for the industrial land use scenario were 4 and 2, respectively. The maximum and RME EPCs for antimony, arsenic, and lead exceeded their respective non-carcinogenic residential PRGs. The maximum EPC for antimony, arsenic, and lead exceed their respective non-carcinogenic industrial PRGs. The RME EPC for antimony exceeds its non-carcinogenic industrial PRG.

Contributing Sources	Transport Mechanisms	Exposure Route	Receptors: Current Land Use — Onsite Worker (Adult/Child)	Current Land Use — Offsite Resident (Adult/Child)	Current Land Use — Trespasser (Adult/Child)	Current Land Use — Ecological Receptors	Future Land Use (1) — Onsite Worker (Adult/Child)	Future Land Use (1) — Onsite Resident (Adult/Child)	Future Land Use (1) — Offsite Resident	Future Land Use (1) — Trespasser (Adult/Child)	Future Land Use (1) — Ecological Receptors	
Surface Soil	Windborne Particulates	Inhalation of Fugitive Particulates	Incomplete	Incomplete	Incomplete	Incomplete	Potentially Complete	Potentially Complete	Incomplete	Potentially Complete	Insignificant	For current scenarios, all pathways for surface soil are incomplete because a 2-foot cap covers the entire site. If the cap is removed in the future, some exposure pathways may be potentially complete. For future scenarios for onsite workers, inhalation may be a potentially complete pathway from fugutive dust generated during dry, windy conditions or during construction or remediation activities. Potentially complete for future onsite residents but highly unlikely based on projected future uses. Future trespassers could gain access to the site if it were developed for industrial uses.
	Volatilization	Inhalation of VOCs	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Volatile organic compounds were not idenitified as chemicals of potential concern.
	Direct Contact	Dermal Absorption	Incomplete	Incomplete	Incomplete	Incomplete	Potentially Complete	Potentially Complete	Incomplete	Potentially Complete	Insignificant	For current scenarios, all pathways for surface soil are incomplete because a 2-foot cap covers the entire site. Dermal absorption from surface soil is potentially complete for future onsite workers. Potentially complete for future on-site residents but highly unlikely based on projected land use. Future trespassers could gain access to the site if it were developed for industrial use. Dermal absorption from surface soil is potentially complete for future ecological receptors, but scientific data to estimate this exposure in wildlife is lacking, so the pathway is not evaluated quantitatively. Soil invertebrates ingested as food by wildlife are assumed to take up soil COPCs through the skin. Exposure to COPCs by dermal absorption by wildlife is expected to be insignificant compared to exposure by ingestion pathways.
		Incidental Ingestion of Soil	Incomplete	Incomplete	Incomplete	Incomplete	Potentially Complete	Potentially Complete	Incomplete	Potentially Complete	Potentially Complete	For current scenarios, all pathways for surface soil are incomplete because a 2-foot cap covers the entire site. For future scenarios, incidental ingestion of surface soil by onsite workers is potentially complete. Potentially complete for future onsite residents but highly unlikely based on projected land use. Future trespassers may gain access to the site if it were developed for industrial use. For future scenarios, incidental ingestion of surface soil by terrestrial wildlife is part of normal feeding activities, therefore, this pathway is considered potentially complete.
	Bio-uptake	Ingestion of Plants/Animals (bio-uptake)	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Potentially Complete	There are no agricultural activities on site. Pathways to recreational users or onsite workers is considered incomplete for both current and future scenarios. Terrestrial wildlife ingest plant parts (i.e., leaves seeds, stems, roots) and soil invertebrates that may have taken up COPCs from surface soil into their body tissues. Therefore, ingestion of contaminated food is considered a complete exposure pathway and is evaluated quantitatively for future scenarios.
Subsurface Soil	Direct Contact	Dermal Absorption	Potentially Complete	Incomplete	Incomplete	Incomplete	Potentially Complete	Incomplete	Incomplete	Incomplete	Incomplete	Infiltration to subsurface soil is possible, so exposure pathways to human receptors for current and future scenarios are potentially complete for construction or remedial activities. Residents are not expected to come into contact with subsurface soil because of the vegetative cap placed on surface soil which would limit any contact with subsurface soil. Terrestrial wildlife do not normally contact subsurface soils, therefore this pathway is considered incomplete. The majority of bird and mammal exposure comes from ingestion of food (plants and soil invertebrates). The majority of plant and invertebrate chemical exposure is from uptake in the top 2 feet of soil.
		Incidental Ingestion										
Leaching to Groundwater	Direct Contact	Ingestion of Groundwater	Insignificant	Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Human receptors may be exposed to groundwater during construction and excavation activities. Dermal absorption, incidental ingestion, and inhalation are all insiginificant pathways for both current and future scenarios. Groundwater samples indicated that the presence of metals in soil is not leaching to groundwater at concentrations that have the potential to adversely affect human health. Ecological receptors are not normally exposed to groundwater. Dermal absorption, incidental ingestion, and inhalation are all insignificant pathways for both current and future scenarios.
		Dermal Absorption										
		Inhalations of VOCs										
Discharge from Groundwater to Surface Waters of Pearl Harbor	Direct Contact	Dermal Absorption	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Incomplete	Insignificant	For current use, human receptor exposure to groundwater seeps entering Pearl Harbor is considered insignificant due to low frequency and dilution/attenuation of constituents. Ecological receptor exposure to groundwater seeps entering Pearl Harbor is considered insignificant due to distance to the shore line and dilution/attenuation of constituents.
		Incidental Ingestion										
		Inhalation of VOCs	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Volatile organic compounds were not idenitified as chemicals of potential concern.
Sediment	Direct Contact	Dermal Absorption	Insignificant	Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Contaminated soil potentially eroded from the Bldg. 284 Slope Site and was deposited in Pearl Harbor prior to construction of the cap. However, the existing soil cap will prevent erosion of contaminated soil if it is maintained. Any potential sediment exposure to current and future receptors is being addressed in the Pearl Harbor Sediment Study.
		Incidental Ingestion	Insignificant	Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Same as above.
	Air Transport	Inhalation of VOCs	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Volatile organic compounds were not idenitified as chemicals of potential concern.
		Inhalation of Particulates	Insignificant	Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Contaminated soil potentially eroded from the Bldg. 284 Slope Site and was deposited in Pearl Harbor prior to construction of the cap. However, the existing soil cap will prevent erosion of contaminated soil if it is maintained. Any potential sediment exposure to current and future receptors is being addressed in the Pearl Harbor Sediment Study.

(1) Future conditions are assumed to be similar to current conditions for ecological receptors.

Figure 4
Building 284 Conceptual Site Model (CSM)

The vegetative soil cap and rip-rap revetment over the sloped area of the Bldg. 284 Site, as detailed in Section 2.2.3.5, effectively prevents potential exposure of humans to unacceptable metals concentrations. On-going monitoring and maintenance of the soil cap/ revetment will ensure that it remains protective of human health.

2.2.6.2 Ecological Risk Assessment

The ecological risk assessment focused on the potential for exposure of wildlife, plants, and soil organisms to surface soil remaining at the Bldg. 284 Site and the potential for contaminated soil to erode into the harbor where it is incorporated into the sediment.

The vegetative soil cap and rip-rap revetment over the sloped area of the Bldg. 284 Site, as detailed in Section 2.2.3.5, effectively prevents potential exposure of wildlife to unacceptable metals concentrations and prevents erosion of soil into the harbor. There are no unacceptable risks to ecological receptors at the Bldg. 284 Site as long as the protective covers (vegetative soil caps, rip-rap revetment) are maintained. Thus, on-going monitoring and maintenance of the soil cap and revetment will ensure that it remains protective of the environment.

2.3 Former Bldgs. 80 and 302 Site Background

This section provides specific details regarding past site investigations, removal actions accomplished, and risk assessment results for the Former Bldgs. 80 and 302 Site.

2.3.1 Former Bldgs. 80 and 302 Location and Description

The Former Bldgs. 80 and 302 Site is located on the south end of Ford Island, approximately 350 feet from the Pearl Harbor shoreline (Figure 2). A site map for the Former Bldgs. 80 and 302 Site is shown on Figure 5. The portion of the site located west of Independence Street, is generally flat, and mostly covered with concrete including the former Bldgs. 80 and 302 foundations and a parking area south of the foundations. Former Bldg. 4 was located in the location of the current parking area, between former Bldgs. 80 and 302 and Bldg. 3. Bldg. 3 is located in the southern portion of the site west of Independence Street. The portion of the site located east of Independence Street is generally a flat, open grassy area with large monkey pod trees. The area includes a vegetative soil cap in the north central portion and a volleyball court and barbeque area in the southern portion.

2.3.2 Former Bldgs. 80 and 302 History and Potential Sources of Contamination

2.3.2.1 Site History

Former Bldgs. 80 and 302 were built before 1942 and demolished between 1982 and 1994. The site was a garage and vehicle maintenance area. Bldg. 3 and former Bldg. 4 were constructed in 1922. Bldg. 4 was demolished in 1997. The grassy area east of Independence Street was a housing area that had been built before 1942.

2.3.2.2 Potential Sources of Contamination

The former Bldg. 80 garage was equipped with vehicle lifts and grease racks, presumably to perform vehicle maintenance and repair. Potential hazardous substances used at this facility were found in lead-acid batteries, paints, solvents, and petroleum-based fuels and lubricants. Similar vehicle maintenance facilities constructed prior to recent environmental regulations have used sumps, oil/water separators, or dry wells to dispose of used materials and waste.

The former Bldg. 302 grease ramp shed remnants are still visible. Potential hazardous substances used at this facility were found in lead-acid batteries, paints, solvents, and petroleum-based lubricants.

Former Bldg. 4 (located between former Bldgs. 80 and 302 and Bldg. 3) was used as a boathouse and contained a metal and pipe shop, carpenter and joiner shop, paint shop, and spray booths.

The area east of Independence Street was a former housing area that contained Bldgs. 48 through 53, which were built before 1942 (Earth Tech 1998). No storage or release of hazardous substances is known to have occurred at the former housing area. Contamination observed east of Independence Street is likely attributable to the historical activities conducted at former Bldgs. 80 and 302.

2.3.3 Former Bldgs. 80 and 302 Previous Investigations and Removal Actions

2.3.3.1 REMEDIAL INVESTIGATION

During the Ford Island RI, Former Bldgs. 80 and 302 were investigated to evaluate whether potential chemical releases from past operations have impacted the site. Surface soil, subsurface soil, and groundwater samples were collected and analyzed for VOCs, SVOCs, TPH-GRO, TPH-DRO/LRO, and metals. Groundwater samples were also analyzed for total dissolved solids and chlorides. The RI included a human health PRE and an ecological SRA.

Soil. Results of the human health PRE and ecological SRA indicated that no action was warranted for soil at the site (Earth Tech 2003a). No metals were detected at concentrations above their respective EPA Region 9 human health residential or industrial soil PRGs (EPA Region 9 2004). Although metals were detected in subsurface soil at concentrations above background levels, the no action recommendation for soil was made based on the presence of a concrete and asphalt surface cap, which eliminates exposure pathways to ecological receptors.

Groundwater. Results of the human health PRE and ecological SRA in the RI report indicate that no action is warranted for groundwater (Earth Tech 2003c). Results of the human health risk assessment indicated that only one COPC, arsenic, exceeded its tap water PRG; however, the maximum concentration detected did not exceed its federal maximum contaminant level for drinking water. The concentrations of arsenic detected in groundwater appear to be related to estimated soil background levels, which exceed EPA Region 9 PRGs; therefore, concentrations of arsenic in groundwater were attributed to naturally occurring sources. Results of the ecological risk assessment indicated that metals in groundwater do not pose unacceptable risks to aquatic and benthic receptors after applying an attenuation factor of 10. Therefore, no further action was recommended for groundwater.

Soil and Gravel

Asphalt

Former Building 302 Foundation

Asphalt

Concete pad

Former Building 80 Foundation

Asphalt

Grass

Asphalt

INDEPENDENCE STREET

Grass

Concrete

Coral Gravel

Grass Covered Soil Cap

Grass

Building 3

Pearl Harbor

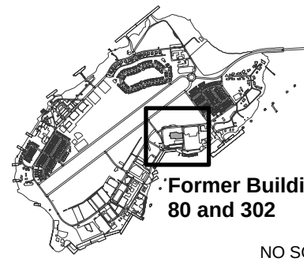
LEGEND

- Approximate extent of contamination remaining at site
- Land use control boundary
- Grass covered soil cap

SOURCES

1. Towill, R.M. Corp. 1999.
2. ControlPoint Surveying, Inc. August 2000.

KEY MAP



Former Buildings 80 and 302

NO SCALE

N

100 50 0 100 Feet

Figure 5
Former Buildings 80 and 302
Land Use Control ROD
Building 284 and
Former Buildings 80 and 302
Ford Island, Pearl Harbor, Hawaii

Map Document: (Q:\GIS\CTO61_ROD\mxd\Proj_Site_map.mxd)
4/22/2008 -- 10:27:18 AM

2.3.3.2 DELINEATION SAMPLING

Because of anticipated redevelopment of the Former Bldgs. 80 and 302 Site, additional delineation sampling was conducted from 2003 to 2006 to delineate the extent of metals in soil at concentrations above background levels. The additional delineation was conducted to ensure areas containing concentrations of metals above background levels in soil were identified so that impacted soil encountered during construction activities was properly managed and would not remain exposed at the land surface. The sampling results indicated that metals contamination was present in surface and subsurface soil within localized areas to the south of the concrete foundation on the west side of Independence Street and in surface and subsurface soil in the area east of Independence Street. Results of the additional delineation sampling were used to identify areas requiring soil removal and capping as part of the TCRAs conducted in 2005 and 2006. The activities and results of the delineation sampling conducted in the areas west and east of Independence Street are presented in Technical Memorandum No. 1 and Technical Memorandum No. 2, which are included as Appendix B and Appendix C, respectively, in the Former Bldgs. 80 and 302 FFS (Earth Tech 2007b)

2.3.3.3 TIME-CRITICAL REMOVAL ACTION

A two-phased TCRA was conducted at the Former Bldgs. 80 and 302 Site. Phase 1, conducted from December 2005 to March 2006, addressed lead in areas west of Independence Street that would be affected during planned construction activities and lead and arsenic in areas east of Independence Street that would be affected during construction of a planned boat storage area. Phase 1 consisted of limited excavation and off-island disposal of contaminated soil. Phase 2 was accomplished from June to July 2006 and addressed surface soil contamination in the remaining localized areas east and west of Independence Street. Surface soil containing elevated concentrations of metals (antimony, arsenic, cadmium, chromium, copper, lead, silver, and zinc) was excavated and consolidated on site under a 2-foot-thick vegetative soil cap in the grassy area east of Independence Street.

2.3.4 Former Bldgs. 80 and 302 Current Site Characteristics

The Former Bldgs. 80 and 302 Site west of Independence Street contains the concrete slab that served as the foundation for the former buildings, which is used as a boat and marine equipment storage area. A narrow grassy strip, where contaminated surface soil was removed during the Phase 2 removal action, is located south of the concrete foundation. The remaining area to the south includes asphalt pavement and a gravel parking lot. An existing building (Bldg. 3) is located in the southern portion of the site and is used as a boat repair shop, general warehouse, and administration building.

The area east of Independence Street is an open grassy area with Monkey Pod trees and is used for recreational purposes. The area contains the vegetated soil cap in the north central portion of the site and a volleyball area and barbeque area in the southern portion of the site.

In subsurface soil west of Independence Street, several metals (cadmium, copper, lead, selenium, and zinc) were still detected at levels exceeding the 95th percentile of the estimated background range for Oahu caprock soil. Cadmium, copper, and zinc exceeded the EPA Region 9 PRGs for residential use, but were less than the EPA Region 9 PRGs for industrial use. Lead exceeded the EPA Region 9 PRGs for both residential and industrial use.

In subsurface soil east of Independence Street, several metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc) were still detected at levels exceeding the 95th percentile of the estimated background range for Oahu caprock soil. Antimony, arsenic, chromium, lead, mercury, nickel, silver, and thallium exceeded the EPA Region 9 PRGs for residential use and only lead exceeded the EPA Region 9 PRG for industrial use.

In surface soil east of Independence Street, several metals (arsenic, chromium, copper, lead, selenium, and zinc) were still detected at levels exceeding the 95th percentile of the estimated background range for Oahu caprock soil. Arsenic, chromium, and lead were the only metals to exceed the EPA Region 9 PRGs for residential use and only arsenic exceeded the EPA Region 9 PRG for industrial use.

Table 2 summarizes the maximum total metals concentrations remaining in surface and subsurface soil at the site. Figure 5 shows the extent of contamination remaining at the Former Bldgs. 80 and 302 Site.

Table 2: Summary of Maximum Total Metals Concentrations Remaining After Removal Action

	Post-Removal Action Conc.		Screening Criteria			
			Oahu Caprock Soil Background Conc.		EPA Region 9 Residential PRG (2004)	EPA Region 9 Industrial PRG (2004)
Metal	Surface Soil	Subsurface Soil	Upper Estimated Background Conc.	95th Percentile		
East of Independence Street						
Antimony	1.9	38.3	8.4	7.3	31	410
Arsenic	18	88.5	29	16	0.39	1.6
Beryllium	ND (< 0.002)	ND (< 0.018)	3.3	2.5	150	1,900
Cadmium	1.9	49.3	3	2.3	37	450
Chromium	278	323	321	250	210	450
Copper	162	27,200	230	110	3,100	41,000
Lead	400	9,600	203[a]	96[a]	400	800
Mercury	0.23	2.9	0.35	0.29	23	310
Nickel	169	787	353	205	1,600	20,000
Selenium	13.9	17.3	11	9	390	5,100
Silver	ND (< 0.03)	3.7	1	0.86	390	5,100
Thallium	ND (< 1.0)	3.6	3	2.7	5.2	67
Zinc	567	14,900	193	166	23,000	100,000
West of Independence Street						
Cadmium	1.2	73	3	2.3	37	450
Copper	112	12,300	230	110	3,100	41,000
Lead	97.5	63,000	203[a]	96[a]	400	800
Selenium	1.7	63.1	11	9	390	5,100
Zinc	212	60,900	193	166	23,000	100,000

Note: All concentrations presented in mg/kg.
Conc. concentration
ND not detected (maximum reporting limit shown in parenthesis)
[a] Represents background from combined natural/anthropogenic sources

2.3.5 Former Bldgs. 80 and 302 Current and Potential Future Site and Resource Uses

2.3.5.1 CURRENT LAND USE

Currently, the area west of Independence Street is used for industrial purposes (i.e., equipment storage, boat repair shop, general warehouse, and administration). The grassy area east of Independence Street is generally used for recreational purposes such as sporting events and picnics.

2.3.5.2 FUTURE LAND USE

The anticipated future land use for this site is commercial/industrial. A housing development is planned for the area north of the Former Bldgs. 80 and 302 Site. The grassy area east of Independence Street will continue to be used for recreational purposes such as sporting events and picnics.

2.3.6 Former Bldgs. 80 and 302 Summary of Site Risks

Risks to human and ecological receptors were evaluated in the post-removal risk assessment presented in the Remediation Verification Report for the Former Bldgs. 80 and 302 Site (Dawson 2007b; Appendix N). The Former Bldgs. 80 and 302 Site CSM (Figure 6) identifies all current and future human health and ecological exposure pathways.

Soil samples were collected to assess the extent of metals contamination in surface and subsurface soil at Former Bldgs. 80 and 302 Site east of Independence, and Former Bldgs. 80 and 302 Site west of Independence located on Ford Island, PHNC, Hawaii. This risk assessment was conducted using data representative of current site conditions following two TCRAs to evaluate risks to human and ecological receptors remaining at the site. The results of the comparison of COCs to project-specific cleanup goals as well as the estimated cumulative risks and hazards following comparison to residential and industrial EPA Region 9 PRGs (2004) for each site are summarized below.

2.3.6.1 FORMER BLDGS. 80 AND 302 SITE EAST OF INDEPENDENCE STREET

None of the RME EPCs for metals in surface soil exceeded their respective cleanup goals. The carcinogenic risks associated with maximum and RME EPCs in surface soil and subsurface soil including background under residential and industrial scenarios exceed the 1E–06 point of departure. The carcinogenic risks associated with maximum and RME EPCs in surface soil (including background under the residential scenario) were 5E–05 and 3E–05, respectively. The carcinogenic risks associated with maximum and RME EPCs in surface soil (including background under the industrial scenario) were 1E–05 and 7E–06, respectively. The carcinogenic risks associated with maximum and RME EPCs in subsurface soil (including background under the residential scenario) were 2E–04 and 3E–05, respectively. The carcinogenic risks associated with maximum and RME EPCs in subsurface soil (including background under the industrial scenario) were 6E–05 and 6E-06, respectively. Arsenic accounts for the majority of the risk and also exceeds its carcinogenic residential and industrial PRGs. The RME EPC for arsenic is below its background value and the Ford Island established cleanup goal for arsenic. When the excess cancer risk from chemical concentrations within background range is excluded, the carcinogenic risk estimates associated with maximum and RME EPCs for surface soil no longer exceed the 1E–06 point of departure. The non-cancer hazards associated with RME EPCs in surface and subsurface soil for industrial land use did not exceed the point of departure of 1. The non-cancer hazards associated with maximum and RME EPCs in subsurface soil for residential land use were 10 and 3, respectively, which exceeded the point of departure of 1. The non-cancer hazards associated with maximum and RME EPCs in surface soil for residential land use did not exceed the point of departure of 1.

The lead hazard quotient (HQ) for small mammals slightly exceeded 1 (HQ = 2). HQ values for the remaining COCs did not exceed 1 for birds or mammals. Because these HQ values are based on a no-effect toxicity reference values, the potential for adverse effects to terrestrial wildlife from surface soil COC exposure is considered acceptable.

2.3.6.2 FORMER BLDGS. 80 AND 302 SITE WEST OF INDEPENDENCE STREET

None of the RME EPCs for metals in surface soil exceeded their respective cleanup goals. The RME EPC for lead in subsurface soil exceeded its cleanup goal. The carcinogenic risks associated with

RME EPCs in surface and subsurface soil for residential and industrial land use were all less than the 1E–06 point of departure. The non-cancer hazards associated with RME EPCs in surface and subsurface soil for both industrial and residential land use did not exceed the point of departure of 1. The non-cancer hazard associated with maximum EPCs in subsurface soil for residential land use was 9, which exceeded the point of departure of 1. The non-cancer hazards associated with maximum and RME EPCs in surface soil did not exceed the point of departure of 1.

None of the site soil COCs had HQ values that exceeded 1, therefore the potential for adverse effects to terrestrial wildlife from surface soil COC exposure is considered acceptable.

2.4 DECISION SUMMARY FOR BLDG. 284 AND FORMER BLDGS. 80 AND 302 SITES

This section contains information regarding the evaluation alternatives and the selected alternative for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site.

2.4.1 Response Action Objectives

Based on the results of risk evaluations, response actions are required at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. The objectives of the response actions are to:

- Minimize or eliminate direct human contact with or ingestion of contaminated soil
- Ensure that risks to ecological receptors are acceptable
- Prevent the migration or relocation of contaminated soil to areas where human or ecological exposure could occur

2.4.2 Identification of Response Action Alternatives

With the exception of the "no action" alternative, the following response actions are commonly implemented to address metals contamination at environmental sites:

- No action
- LUCs
- Removal of remaining contaminated media (no LUCs)
- Phytoremediation
- Electrokinetic separation, in situ and ex situ
- Solidification/stabilization, in situ and ex situ
- Soil washing, ex-situ
- Excavation, soil flushing (chemical extraction), reuse of soil on-island

These potential alternatives were preliminarily screened with respect to implementability, effectiveness, and cost criteria.

As a result of the preliminary screening, the three alternatives below were retained for detailed evaluation and comparative analysis. The retained alternatives that are summarized in the following paragraphs are identical for both sites, except as noted, and include Alternative 1, No Action; Alternative 2, LUCs; and Alternative 3, Remove Remaining Contaminated Media (No LUCs).

Contributing Sources	Transport Mechanisms	Exposure Route	Receptors: Current Land Use — Onsite Worker (Adult/Child)	Current Land Use — Offsite Resident (Adult/Child)	Current Land Use — Trespasser (Adult/Child)	Current Land Use — Ecological Receptors	Future Land Use [1] — Onsite Worker (Adult/Child)	Future Land Use [1] — Onsite Resident (Adult/Child)	Future Land Use [1] — Offsite Resident	Future Land Use [1] — Trespasser (Adult/Child)	Future Land Use [1] — Ecological Receptors	Rationale
Surface Soil	Windborne Particulates	Inhalation of Fugitive Particulates	Potentially Complete	Incomplete	Incomplete	Insignificant	Potentially Complete	Potentially Complete	Incomplete	Potentially Complete	Insignificant	For current and future scenarios for onsite workers, inhalation may be a potentially complete pathway from fugutive dust generated during dry, windy conditions or during construction or remediation activities. Potentially complete for future onsite residents but highly unlikely based on projected future uses. Future trespassers could gain access to the site if it were developed for industrial uses. Inhalation of contaminated dust is expected to be insignificant compared to ingestion because the site is well vegetated and dust generation is minimal.
	Volatilization	Inhalation of VOCs	Insignificant	Incomplete	Incomplete	Insignificant	Insignificant	Incomplete	Incomplete	Insignificant	Insignificant	Inhalation pathway is considered insignificant for both human and ecological receptors because no volatile organic compounds were idenitified as chemicals of potential concern, and therefore were not analyzed in surface soil.
	Direct Contact	Dermal Absorption	Potentially Complete	Incomplete	Incomplete	Insignificant	Potentially Complete	Potentially Complete	Incomplete	Potentially Complete	Insignificant	Dermal absorption from surface soil is potentially complete for current and future onsite workers. Potentially complete for future on-site residents but highly unlikely based on projected land use. Future trespassers could gain access to the site if it were developed for industrial use. Dermal absorption from surface soil is potentially complete for current and future ecological receptors, but scientific data to estimate this exposure in wildlife is lacking, so the pathway is not evaluated quantitatively. Soi l invertebrates ingested as food by wildlife are assumed to take up soil COPCs through the skin. Exposure to COPCs by dermal absorption by wildlife is expected to be insignificant compared to exposure by ingestion pathways.
		Incidental Ingestion of Soil	Potentially Complete	Incomplete	Incomplete	Potentially Complete	Potentially Complete	Potentially Complete	Incomplete	Potentially Complete	Potentially Complete	For current and future scenarios, incidental ingestion of surface soil by onsite workers is potentially complete. Potentially complete for future onsite residents but highly unlikely based on projected land use. Future trespassers may gain access to the site if it were developed for industrial use. For current and future scenarios, incidental ingestion of surface soil by terrestrial wildlife is part of normal feeding activities, therefore, this pathway is considered potentially complete.
	Bio-uptake	Ingestion of Plants/Animals (bio-uptake)	Incomplete	Incomplete	Incomplete	Potentially Complete	Incomplete	Incomplete	Incomplete	Incomplete	Potentially Complete	There are no agricultural activities on site. Pathways to recreational users or onsite workers is considered incomplete for both current and future scenarios. Terrestrial wildlife ingest plant parts (i.e., leaves seeds, stems, roots) and soil invertebrates that may have taken up COPCs from surface soil into their body tissues. Therefore, ingestion of contaminated food is considered a complete exposure pathway and is evaluated quantitatively for both current and future scenarios.

Figure 6
Former Buildings 80 and 302 Conceptual Site Model

Contributing Sources / Transport Mechanisms / Exposure Route	Receptors: Current Land Use — Onsite Worker (Adult/Child)	Current Land Use — Offsite Resident (Adult/Child)	Current Land Use — Trespasser (Adult/Child)	Current Land Use — Ecological Receptors	Future Land Use [1] — Onsite Worker (Adult/Child)	Future Land Use [1] — Onsite Resident (Adult/Child)	Future Land Use [1] — Offsite Resident	Future Land Use [1] — Trespasser (Adult/Child)	Future Land Use [1] — Ecological Receptors	Rationale
Subsurface Soil → Direct Contact → Dermal Absorption; Incidental Ingestion	Potentially Complete	Incomplete	Incomplete	Incomplete	Potentially Complete	Incomplete	Incomplete	Incomplete	Incomplete	Infiltration to subsurface soil is possible, so exposure pathways to human receptors for current and future scenarios are potentially complete for construction or remedial activities. Residents are not expected to come into contact with subsurface soil because of the vegetative cap placed on surface soil which would limit any contact with subsurface soil. Terrestrial wildlife do not normally contact subsurface soils, threfore this pathway is considered incomplete. The majority of bird and mammal exposure comes from ingestion of food (plants and soil invertebrates). The majority of plant and invertebrate chemical exposure is from uptake in the top 2 feet of soil.
Leaching to Groundwater → Direct Contact → Ingestion of Groundwater; Dermal Absorption; Inhalations of VOCs	Insignificant	Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Human receptors may be exposed to groundwater during construction and excavation activities. Dermal absorption, incidental ingestion, and inhalation are all insiginificant pathways for both current and future scenarios. Groundwater samples indicated that the presence of metals in soil is not leaching to groundwater at concentrations that have the potential to adversely affect human health. Ecological receptors are not normally exposed to groundwater. Dermal absorption, incidental ingestion, and inhalation are all insiginificant pathways for both current and future scenarios.
Discharge from Groundwater to Surface Waters of Pearl Harbor → Direct Contact → Dermal Absorption; Incidental Ingestion	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Incomplete	Insignificant	For current use, human receptor exposure to groundwater seeps entering Pearl Harbor is considered insignificant due to low frequency and dilution/attenuation of constituents. Ecological receptor exposure to groundwater seeps entering Pearl Harbor is considered insignificant due to distance to the shore line and dilution/attenuation of constituents.
Inhalation of VOCs	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Same as above.

Figure 6
Former Buildings 80 and 302 Conceptual Site Model

Contributing Sources	Transport Mechanisms	Exposure Route	Receptors: Current Land Use — Onsite Worker (Adult/Child)	Current Land Use — Offsite Resident (Adult/Child)	Current Land Use — Trespasser (Adult/Child)	Current Land Use — Ecological Receptors	Future Land Use [1] — Onsite Worker (Adult/Child)	Future Land Use [1] — Onsite Resident (Adult/Child)	Future Land Use [1] — Offsite Resident	Future Land Use [1] — Trespasser (Adult/Child)	Future Land Use [1] — Ecological Receptors	Rationale
Sediment	Direct Contact	Dermal Absorption	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	No sediment was present at Former Buildings 80 and 302 Sites East and West of Independence. In addition, the topography at the site is relatively flat and no significant drainage pathways from areas containing contaminated surface soil to Pearl Harbor exist.
		Incidental Ingestion	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Same as above.
	Air Transport	Inhalation of VOCs	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	No sediment was present at Former Buildings 80 and 302 Sites East and West of Independence.
		Inhalation of Particulates	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Same as above.

(1) Future conditions are assumed to be similar to current conditions for ecological receptors.

Figure 6
Former Buildings 80 and 302 Conceptual Site Model

Alternative 1: No Action. This alternative assumes that site conditions will be left in their current state. If no action were taken, the remaining contaminated soil and debris fill would be left in place and would continue to pose potential health risks to human and ecological receptors. No additional actions, such as institutional controls (e.g., restrictive land use covenants, legal notices) or site monitoring would be implemented at the site. The no action alternative provides a baseline comparison with other alternatives being evaluated.

Alternative 2: LUCs. This alternative includes the protective structures (i.e., the vegetative soil cap, rip-rap revetments, building structures, and monitoring wells for the Bldg. 284 Site and the vegetative soil cap and existing paved and gravel areas, and building structures for the Former Bldgs. 80 and 302 Site) that are currently in place at each site. In addition, institutional (legal) controls would include long-term maintenance and inspections for both sites and groundwater monitoring at the Bldg. 284 Site. LUCs will be instituted to ensure the current industrial land use is maintained at the site, and to prohibit any unauthorized land modifications. Examples of such land modifications include activities that might disturb the existing vegetative soil caps or existing building structures for the two sites, the rip-rap revetment at the Bldg. 284 Site, and gravel parking areas and asphalt-paved areas at the Former Bldgs. 80 and 302 Site; such activities could potentially expose contaminated soil at the two sites. If activities that may expose contaminated soil must occur, the Navy will ensure proper handling and disposal of the soil. Institutional controls placed in Navy land use registries (e.g., NIRIS, LUC tracker) will be discussed in the LUC WP. These institutional controls may include land use covenants (restricting site construction activities and land use to commercial/industrial only); notice of site contamination and land use restrictions; and Navy and EPA rights of access for purposes of site inspection and further response action, if necessary. These institutional controls will ensure the continued integrity and effectiveness of these protective structures. Future actions associated with the LUC alternative are expected to be easily implemented, effective in protecting human health and the environment, and cost-effective. Approximate costs for implementation of institutional and engineering LUCs, including LTMM, are $237,200 for the Former Bldgs. 80 and 302 Site, and $2,244,000 for Bldg. 284 Slope Site.

Alternative 3: Remove Remaining Contaminated Media (No LUCs). This alternative involves excavating all remaining site debris and soil contaminated with metals above background concentrations, leaving the site safe for human and ecological receptors and allowing unrestricted use of the site. The total volume of the Bldg. 284 Site contaminated media is estimated to be 4,300 cubic yards. The total volume of the Former Bldgs. 80 and 302 Site contaminated media is estimated to be 4,700 cubic yards. Excavated areas would be backfilled with clean soil and re-vegetated. Excavated contaminated media would be disposed of at a permitted, offsite disposal facility approved to accept CERCLA remediation waste. LUCs (i.e., engineering and institutional controls), long-term monitoring, and compliance reporting would not be required. This alternative can be easily implemented and would be effective in protecting human health and the environment; however, costs associated with extensive site excavation and contaminated soil transport and disposal could be high. Approximate costs for excavation, transport, and mainland disposal are $4,766,300 for the Former Bldgs. 80 and 302 Site, and $4,357,000 for Bldg. 284 Slope Site.

2.4.3 Evaluation of Alternatives

Major components of each of the retained alternatives are summarized in Table 3.

Table 3: Identification of Action Alternatives

Alternative 1: No Action	Alternative 2:LUCs	Alternative 3: Removal of Remaining Contaminated Media (no LUCs)

No action is taken at site.	• **Institutional (legal) controls placed in Navy land use registries include:**
	  • Land use restrictions (restricting site construction activities and land use to commercial/ industrial only) and running in perpetuity or until no longer necessary
	  • Notice of site contamination and land use restrictions
	  • Right of access for purposes of site inspection and further response action, if necessary
	• **Long-term maintenance and reporting includes:**
	  • LTMM of the soil cap and revetment to ensure structural integrity and continued effectiveness
	  • Long-term groundwater monitoring at the Bldg. 284 site only
	  • CERCLA 5-year reviews to ensure that the soil cap and revetment are not disturbed and the site remains protective
		• Excavate all remaining debris and soil contaminated with metals concentrations that exceed background levels. Total soil removal volume is estimated to be 4,300 cubic yards for Bldg. 284 and 4,700 cubic yards for the Former Bldgs. 80 and 302 Site.
		• Confirmation samples are collected at sites to verify attainment of the target cleanup goals.
		• Excavated areas are backfilled with clean, on-island soil and re-vegetated.
		• Excavated soil and debris is containerized for shipment and disposal at a disposal facility approved to accept CERCLA remediation waste.
		• No CERCLA 5-year reviews are required.
		• No LUCs are required since site becomes suitable for unrestricted use.
		• No LTMM is required.

The evaluation of alternatives was based on the nine criteria specified by the NCP (40 CFR 300.430(e)(9)(iii)) and EPA guidance for conducting RIs and feasibility studies under CERCLA (1988). The nine evaluation criteria specified by the NCP are listed in 40 CFR 300.430(e)(9)(iii). The alternatives for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site are identical except that groundwater monitoring will be conducted at the Bldg. 284 Site and cost differences. Table 7 of the Building 284 FFS and Table 10 of the Building 80 FFS profile the relative performance of each alternative against the nine criteria.

A five tiered scale (poor, fair, good, very good, and excellent) was then applied to each of the final alternatives as shown in Table 8 of the Building 284 FFS and Table 11 of the Building 80 FFS, which assess the relative performance of each alternative and select the preferred alternative.

2.4.4 Principal Threat Waste

The NCP establishes an expectation that treatment will be used to address the principal threats (i.e., source material that is highly toxic and/or highly mobile) posed by a site wherever practicable. No highly toxic or highly mobile source material was identified at the Bldg. 284 Site or the Former Bldgs. 80 and 302 Site; therefore, no principal threat wastes exist.

2.4.5 Selected Final Remedy

2.4.5.1 Summary of the Rationale for the Selected Final Remedy

The primary objective of the final remedy at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site is to prevent exposure to COCs (elevated levels of metals) present in subsurface soil and prevent the migration or relocation of contaminated soil to areas where human or ecological exposure could occur (i.e., non-contaminated areas, Pearl Harbor). The final recommended remedy consists of LUCs and LTMMs. This alternative protects against potential threats to workers or ecological receptors from contaminants at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. Inspections and maintenance of the vegetative soil caps, existing building structures, rip-rap revetment at Bldg. 284 Site, gravel areas and paved areas at the Former Bldgs. 80 and 302 Site, groundwater monitoring at the Bldg. 284 Site, and implementation of LUCs, will ensure that the sites pose no unacceptable risk over time. Attachment A includes tables from the FFSs for the Bldg. 284 Site (Attachment A-1) and the Former Bldgs. 80 and 302 Site (Attachment A-2) that compare the remedy alternatives that were

evaluated. Although assigned a similar overall ranking, the remedy (including LUCs and LTMMs) was selected as the final remedy over the removal of all contaminated site media because it meets the response action objectives and the removal of all contaminated site media was cost prohibitive.

2.4.5.2 DESCRIPTION OF THE SELECTED FINAL REMEDY

Under CERCLA, LUCs are appropriate for sites that have been shown to be safe and suitable for industrial or commercial reuses, but may not be suitable for unrestricted (residential) reuse. Completed remedial investigation and risk evaluation efforts have shown the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site to be suitable for commercial/industrial reuse as long as LUCs are implemented. The establishment of LUCs provides the best alternative for eliminating or limiting future exposure pathways. The Navy and EPA Region 9, in coordination with EPA Headquarters and with concurrence from the DOH, recommend that LUCs and LTMM serve as the final remedy for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site (Section 1.7). The following actions will fulfill the LUC Performance Objectives:

- Prohibiting unauthorized digging or disturbing of site soil
- Prohibiting unauthorized excavation and removal of site soil to an offsite location to ensure proper handling and disposal of any soil generated
- Prohibiting the development and use of the property for residential housing, elementary or secondary schools, and child care facilities
- Ensuring protective covers are maintained
- Ensuring metals have not impacted the underlying shallow groundwater at the Bldg. 284 Site at concentrations that could adversely impact adjacent Pearl Harbor
- Maintaining the viability of the vegetative soil caps and the rip-rap revetment

A LUC WP (Earth Tech 2008) has been submitted for EPA review and approval and the LUC WP will contain the LUC implementation and maintenance actions, including periodic inspections by the Navy to address both engineering and institutional controls. The LUCs will comply with all ARARs and will be maintained in perpetuity to protect human health and the environment by preventing future exposure to contaminated soil. Long-term monitoring and reporting will be required to ensure that the LUCs remain protective at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site over time. The LUC WP will provide details on how the specific LUCs will be implemented and maintained, and specify the requirements for annual inspections and five-year reviews.

Land Use Controls. The engineering and institutional LUCs are presented in detail in the LUC WP (Earth Tech 2008). The LUC boundaries for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site are shown respectively in Figure 3 and Figure 5. LUCs will be instituted to ensure the current industrial land use is maintained at the site and to prohibit any unauthorized land modifications. Examples of such land modifications include activities that might disturb the existing vegetative soil caps or existing building structures for the two sites, the rip-rap revetment at the Bldg. 284 Site, and gravel parking areas and asphalt-paved areas at the Former Bldgs. 80 and 302 Site, which could potentially expose contaminated soil at the two sites. If such activities must occur, the Navy will ensure proper handling and disposal of the soil.

Should the property ever be transferred, the LUCs will be maintained through appropriate deed restrictions. Implementation of LUCs will be confirmed by annual inspections to be performed by the Navy or subsequent property owner if the property is ever transferred. In the event that the Navy transfers these LUC responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. This may be modified to include another party should the site-specific circumstances warrant it. The Navy shall implement internal procedures for upholding LUCs by maintaining a database of the LUCs (i.e., Naval Installation Restoration Information Solution).

Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or other means, the Navy shall retain ultimate responsibility for remedy integrity.

LUCs will be maintained at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site until the concentration of hazardous substances in the soil and groundwater are at such levels as to allow for unrestricted land use and exposure. The Navy shall prepare and submit to EPA and DOH for review and approval a LUC work plan that shall contain implementation and maintenance actions, including periodic inspections.

Five-Year Reviews. Five-year reviews are required for all CERCLA response actions that leave contaminants in place at concentrations above levels that allow for unlimited land use and unrestricted exposure. Because elevated levels of metals remain in place at such concentrations, five-year reviews will be performed by the Navy (or subsequent property owner if the property is ever transferred) to ensure that the final remedy remains effective in preventing exposure to contaminated soil.

2.4.5.3 Response Action Objectives

Performance objectives for the LUCs being implemented as an integral part of the final remedy are to restrict current and future land use to activities compatible with vegetative soil cap and rip-rap revetment inspection and maintenance and to ensure long-term viability of the final remedy. Specific Response Action Objectives include the following:

- Protect human health and the environment by eliminating exposure pathways to human and ecological receptors
- Protect groundwater quality
- Ensure no unauthorized excavation, uncontrolled soil removal, or construction occurs
- Provide adequate notice of the presence of contaminated soil to users, workers, and any potential landowners
- Ensure that the sites are not used for any purpose that violates the objectives of the LUCs by limiting the development and use of this area to commercial or industrial facilities.

The Navy shall implement internal procedures for upholding LUCs by maintaining a database of the LUCs (i.e., Naval Installation Restoration Information Solution).

2.4.5.4 Summary of the Estimated Final Remedy Costs

The engineering cost estimate for the selected final remedy is $2,244,000 for the Bldg. 284 Site and $237,200 for the Former Bldgs. 80 and 302 Site. The costs are summarized in the Cost Estimate Summary Tables in Appendix C of the Building 284 FFS, and Appendix D of the Building 80 FFS.

2.4.5.5 Expected Outcomes of the Selected Final Remedy

The selected final remedy for the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site will reduce potential future human health and ecological risks by preventing future exposure to contaminated media and erosion of fill material into the harbor as well as restricting activities at the site. This will

be achieved by maintaining the condition of the vegetative soil cap, rip-rap revetment, existing building structures, gravel areas, and paved areas to eliminate direct contact with contaminated soil. Site use will remain restricted to commercial/industrial use only. The shallow groundwater underlying Ford Island is not currently used as a potable source and site-specific hydrogeologic factors, along with relevant federal and state regulations and guidance, indicate that the shallow groundwater on Ford Island will not be developed in the future as a drinking water source. Groundwater monitoring at the Bldg. 284 Site will ensure that contaminated soil remaining at the site does not adversely impact the underlying shallow groundwater. This final remedy does not change the current or planned future land or groundwater use. However, this final remedy does not reduce the toxicity or volume of waste or contaminants at the site, and requires that restrictive LUCs be implemented because the site will not be compatible with unrestricted use due to the waste remaining in place.

2.4.6 Statutory Determinations

2.4.6.1 Protection of Human Health and the Environment

The selected final remedy will be protective of human health and the environment by maintaining the integrity of the vegetative soil cap, paved areas, and rip-rap revetment, and controlling land use. This will ensure that the impacted soils are not disturbed. Groundwater monitoring at the Bldg. 284 Site will ensure COCs do not migrate to Pearl Harbor via the underlying shallow groundwater and adversely impact the adjacent surface water. Potential risks posed by the site are reduced when new routes for exposure to the COCs are not created. Short-term exposure risks are avoided by leaving the remaining contaminated soils in place.

2.4.6.2 Compliance with Applicable or Relevant and Appropriate Requirements

The NCP established a general requirement that response actions comply with ARARs, based on site-specific conditions. “Applicable requirements” are promulgated environmental cleanup standards, standards of control, and other substantive requirements, criteria, or limitations that specifically address a hazardous substance, remedial action, location, or other circumstance found at a CERCLA site. “Relevant and appropriate requirements” are promulgated environmental cleanup standards, standards of control, and other substantive requirements, criteria, or limitations that, while not legally “applicable” to the site conditions, address problems or situations sufficiently similar to those encountered at the site that their use is well suited for the site. Other “to-be-considered” (TBC) criteria, such as non-promulgated policy and guidance documents, may also be useful in directing a response action at a site. All ARARs and TBC criteria are identified on the basis of site-specific information about the chemicals present, site features, and response actions being considered. Location-specific and action-specific criteria were evaluated.

The ARARs and TBC criteria relevant to the selected alternative are identified for surface and subsurface soil response actions. According to Navy/Marine Corps policy, all actions carried out under the Environmental Restoration Program (DON 2006c) must be consistent with the ARARs identified for the site, which are presented in Table 4.

2.4.6.3 Cost-Effectiveness

The selected final remedy is cost-effective and represents a reasonable value for the expended public funding. Each response alternative was evaluated to determine whether the overall effectiveness satisfied the threshold criteria. The relationship of the overall effectiveness of the selected alternative was determined to be proportional to its costs. The selected final remedy is effective in meeting response action objectives and protecting human health and the environment, is implementable, and is cost-effective. Table 5 summarizes the cost-effectiveness of the three response action alternatives.

2.4.6.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected alternative represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner. Specifically, this alternative provides the best short- and long-term effectiveness, is protective of human health and the environment, complies with ARARs, achieves response action objectives, reduces contaminant mobility, and is feasible. Details regarding the evaluation of the selected alternative and other alternatives including permanent solutions and treatment technologies are provided in the feasibility studies for the Bldg. 284 Site (Earth Tech 2007a) and the Former Bldgs. 80 and 302 Site (Earth Tech 2007b).

2.4.6.5 Preference for Treatment as a Principal Element

This final remedy does not satisfy the statutory preference for treatment as a principal element of the final remedy. The NCP, 40 CFR Section 300.430(a)(1)(iii)(A), establishes the expectation that treatment will be used to address the principal threats at a site where practicable. A principal threat waste is source material with toxicity and mobility characteristics that combine to pose a potential risk greater than the risk level that is acceptable for the current or future exposure scenarios. As discussed in Section 2.4.4, there are no principal threat wastes at the Bldg. 284 Site and the Former Bldgs. 80 and 302 Site. Because there are no principal threat wastes, treatment is not necessary as a principal element of the final remedy for these sites.

2.4.6.6 Five-Year Review Requirement

Because the selected alternative results in contaminants remaining on site above levels that do not allow for unlimited use and unrestricted exposure, Five-Year Reviews are required after the initiation of the final remedy to ensure that the final remedy is protective of human health and the environment.

2.4.7 Documentation of Significant Changes

The PP (DON 2008) identified LUCs and LTMM as the Navy's recommended alternative. On 25 February 2008, the PP was released for public comment and a public meeting to present and discuss the PP was held 5 March 2008.

The Navy has reviewed all comments received during the 5 March 2008 public meeting and during the 25 February 2008 through 25 March public comment period. Based on all site information and risk evaluations completed to date, the Navy, EPA Region 9, and the DOH have confirmed that the selected final remedy is protective of human health and the environment. None of the comments affect the preference for the selected final remedy. Therefore, no significant changes in the final remedy, as it was originally identified in the PP (DON 2008), were necessary as a result of public comment.

Table 4: Ford Island Policy Requirements and Regulations

Policy/Regulation (Citation)	Description	Regulatory Status	Potential Application to Site
Location-specific ARARs and TBC Criteria			
Endangered Species Act of 1973 (16 U.S.C. §§ 1531 et seq)	Conservation of endangered species or threatened species. Requires consultation with NMFS and USFWS to determine the potential impacts of the proposed project on any federally listed species designated as threatened or endangered for compliance with Section 7 of the Act.	Applicable requirement for all response action alternatives.	The Navy will consult informally with the NMFS and USFWS to identify threatened or endangered species that may be impacted by response activities and necessary mitigating measures to be taken. Formal consultation with the USFWS will be required if an action may affect a listed species or its habitat. All response actions will be conducted in a manner to minimize adverse impacts to such species, such as the green sea turtle (*Chelonia mydas*) and their habit. Sensitive species and habitat were previously identified during the ecological SRA conducted for the site.
Hawaii Endangered and Threatened Species Regulations (HAR Chapter 13-122 and 124)	Regulations prohibit the taking of any state-listed threatened or endangered species, without obtaining a permit.	Applicable requirement for all response action alternatives.	All response actions will be conducted in a manner to protect listed species. Effort will be made to conduct response activities away from areas identified during the RI ecological SRA that potentially provide habitat to endangered species or sensitive receptors.
NHPA (16 U.S.C. §§ 470, et seq.)	Regulations regarding mitigating impacts to historic structures and landmarks during federal projects. NHPA regulations include 36 CFR Part 800.	Applicable requirement for all response action alternatives.	All response actions will be conducted in compliance with the substantive requirements. The Navy will consult with the Department of Land and Natural Resources, State Historic Preservation Office, and the ACHP to identify historic structures and landmarks, potential impacts to these historic resources from response actions, and any necessary mitigating measures to be taken. NHLs near the cleanup site include Ford Island itself, Bldg. 284, Structure S-362 (seaplane pier), Ramp 6, and Bldg. 255.
CZMA Program Federal Consistency (16 U.S.C. 1451 et seq.; 15 CFR 930)	Requirement for a consistency determination to ensure that the project meets the state CZMA Program policy guidelines and objectives.	Applicable requirement for all response action alternatives.	All response actions will be conducted in a manner consistent with the Hawaii Coastal Zone Management Program (Office of State Planning 1990) and Hawaii Ocean Resources Management Plan (Office of State Planning 2006).
Action-specific ARARs and TBC Criteria			
RCRA Hazardous Waste Determination (40 CFR 262.11)	Requires generators of solid waste to determine if their waste is regulated as hazardous waste, according to 40 CFR 261.	Applicable requirement for response action alternatives that generate remediation waste.	Remediation waste (e.g., soil, debris) generated at the site will be screened and characterized to determine whether it is RCRA hazardous. Such hazardous waste has special management and disposal requirements that must be complied with.
DoD Policy and Guidance Document on LUCs Associated with Environmental Restoration Activities for Active Installations (DoD 2001)	Provides guidance on implementing, documenting, and managing LUCs at active military installations.	TBC criteria for alternatives with LUC components.	Used to identify, evaluate, and select appropriate LUCs (e.g., landfill cap, fencing, signage, deed restrictions, legal notifications) for the protection of the human health and the environment at the site.
Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA 1993); Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (EPA 1996)	Regulatory guidance that establishes source containment as the CERCLA presumptive remedy for municipal landfill sites and similar military landfill sites (including those that contain construction debris). Identifies components of the containment presumptive remedy that may be necessary based on site-specific conditions [a]	TBC for response action alternatives that leave waste in place.	Response action alternatives that contain waste shall consider the appropriateness of implementing the remedy components identified in the guidance.

ACHP	Advisory Council on Historic Preservation	DoD	Department of Defense	RCRA	Resource Conservation and Recovery Act
BMP	best management practices	NHL	National Historic Landmark	R&HA	Rivers and Harbors Act
C&D	construction and demolition	NHPA	National Historic Preservation Act	SRA	screening risk assessment
CWA	Clean Water Act	NMFS	National Marine Fisheries Service	USFWS	U.S. Fish and Wildlife Service
CZMA	Coastal Zone Management Act	NPDES	National Pollution Discharge Elimination System	WQC	Water Quality Certification

[a] Site-specific conditions may include landfill cap, groundwater control, leachate collection/treatment, landfill gas collection/treatment, institutional controls.

Table 5: Cost Effectiveness Summary

Alternative	2007 Worth Cost	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Rating
Bldg. 284 Site				
No Action	$0	No reduction in long-term risk to human health or the environment	No reduction in toxicity, mobility, or volume	Poor
LUCs	$2,244,000[a]	Substantial reduction in long-term risk to human health or the environment	Reduction in mobility, no reduction in toxicity or volume	Very Good
Removal of Remaining Contaminated Media (no LUCs)	$4,357,000	Substantial reduction in long-term risk to human health or the environment	Reduction in toxicity, mobility, and volume at the site	Very Good
Former Bldgs. 80 and 302 Site				
No Action	$0	No reduction in long-term risk to human health or the environment	No reduction in toxicity, mobility, or volume	Poor
LUCs	$237,200[b]	Substantial reduction in long-term risk to human health or the environment	Reduction in mobility, no reduction in toxicity or volume	Very Good
Removal of Remaining Contaminated Media (no LUCs)	$4,766,300	Substantial reduction in long-term risk to human health or the environment	Reduction in toxicity, mobility, and volume at the site	Very Good

[a] Includes mobilization and planning, clearing and grubbing, capping, residual waste management, groundwater monitoring well installation, long-term groundwater monitoring (30 years, quarterly sampling the first year and annual sampling thereafter), and implementing LUCs (5-Year Reviews).
[b] Includes mobilization and planning, clearing and grubbing, capping, excavation, and implementing LUCs (5-Year Reviews).

3. Responsiveness Summary

A public notice announcing the availability for review of the Proposed Plan (PP) (DON 2008) and other project-related documents was placed in the *Honolulu Advertiser* and *Honolulu Star-Bulletin* on 24 February 2008. A 30-day public comment period for the PP was held from 25 February 2008 to 25 March 2008, and a public meeting to discuss the PP was held at the Aiea Public Library in Aiea, Hawaii, on 5 March 2008. This Responsiveness Summary provides a summary of the public comments received during the public meeting.

Members of the community present at the public meeting on 5 March 2008 expressed verbal comments on the PP. Responses to the written and verbal comments received during the comment period and public meeting are presented as a Responsiveness Summary in Attachment B within this ROD. The complete transcript of the public meeting is available in the Administrative Record file.

3.1 STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES

A written transcript of the public meeting conducted on 5 March 2008 was thoroughly reviewed by the Navy to prepare the Responsiveness Summary. The comments and questions from the public have been condensed to provide a better understanding of each specific issue. The Navy and EPA Region 9, with approval from Headquarters EPA, and with concurrence from the DOH, have selected the final remedy for the Bldg. 284 Site and Former Bldgs. 80 and 302 Site only after careful consideration of the public's comments on the PP.

3.2 TECHNICAL AND LEGAL ISSUES

The key technical issue for the selected final remedy is the continued long-term care of the vegetative soil cap, rip-rap revetment (Bldg. 284 Site), and gravel, and asphalt-paved areas (Former Bldgs. 80 and 302 Site) to be protective of human health and the environment. In addition, groundwater monitoring will be required at the Bldg. 284 Site. The Navy is responsible for the long-term care of the Bldg. 284 Site and Former Bldgs. 80 and 302 Site and is committed to conducting inspections and maintenance of the vegetative soil cap, rip-rap revetment, and paved areas.

Potential legal issues for the selected final remedy consist of implementation of the necessary LUCs that include restricting future land use of the Bldg. 284 Site and Former Bldgs. 80 and 302 Site. The Navy will retain ownership of the site for the foreseeable future and has no plans to transfer the property, or to use the site other than as open space. Any future land owner will be responsible for implementing and maintaining the LUCs, and any activities conducted at the Bldg. 284 Site and Former Bldgs. 80 and 302 Site that might have impact on the integrity of the vegetative soil cap, rip-rap revetment, or paved areas will need approval from the Navy and EPA, and concurrence from the DOH. In the event that the Navy transfers these LUC responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity.

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Attachment A
Focused Feasibility Alternatives Comparison Tables

Attachment A-1
Bldg. 284 Focused Feasibility Study
Alternatives Comparison Tables

Table 5: Identification of Action Alternatives

Alternative 1: No Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Media (no LUCs)
• No action is taken at site.	• Construction of site engineering controls that will remain in-place, including: Existing stone revetment along shoreline Existing permeable and vegetative soil cap constructed of clean soil over the contaminated soil and debris fill (during the 2006 TCRA) Four existing groundwater monitoring wells located within the fill area • Institutional (legal) controls placed in Navy land use registries include: Land use restrictions (restricting site construction activities and land use to commercial/ industrial only) and running in perpetuity or until no longer necessary Notice of site contamination and land use restrictions Right of access for purposes of site inspection and further response action, if necessary • Long-term maintenance and reporting includes: Long-term monitoring and maintenance of the soil cap and revetment to ensure their structural integrity and continued effectiveness Long-term groundwater monitoring at site CERCLA 5-year reviews to ensure that the soil cap and revetment are not disturbed and the site remains protective	• Excavate all remaining debris and soil contaminated with metals concentrations that exceed background levels. Total soil removal volume is estimated to be 4,300 cubic yards. • Confirmation samples are collected at sites to verify attainment of the target cleanup goals. • Excavated areas are backfilled with clean, on-island soil and re-vegetated. • Excavated soil and debris is containerized for shipment and disposal at a disposal facility approved to accept CERCLA remediation waste. • No CERCLA 5-year reviews are required. • No LUCs are required since site becomes suitable for unrestricted use. • No long-term monitoring or maintenance is required.

Table 7: Evaluation of Response Action Alternatives

Criterion	Alternative 1: No Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Media (no LUCs)
Threshold Criteria			
Overall Protection of Human Health and Environment	Provides no protection of human health and the environment.	Provides protection of human health and the environment because the soil cap prevents direct exposure to impacted soil, protecting human and ecological receptors. The cap also prevents surface soil erosion, reducing impacts to Pearl Harbor waters, and reduces storm water runoff infiltration, reducing impacts to groundwater.	Provides protection of human health and the environment by removing all impacted soil. Increases the mass of waste material at the disposal facility, which is mitigated by placement in a facility specially designed to receive the waste and to ensure long-term containment of the waste through monitoring. Additional audits performed by the EPA, as part of the CERCLA Off-Site Rule, further ensure protection of public health and environment.
Compliance with ARARs	Does not comply with the identified ARARs and TBC criteria.	Complies with the identified ARARs and TBC criteria.	Complies with the identified ARARs and TBC criteria. Because this is an offsite action, the disposal facility must be approved under CERCLA's Off-Site Rule; LDRs and MTRs are applicable and depend on the waste classification.
Primary Balancing Criteria			
Long-Term Effectiveness and Permanence	Provides no long-term effectiveness.	Attains long-term effectiveness. However, contaminated soil will remain in place at the site, requiring implementation of land use controls and 5-year reviews as long as contamination remains at the site, in order to ensure that the contaminated areas are not disturbed or potential routes for exposure created due to future land use changes.	Attains long-term effectiveness and permanence because waste materials are removed from the site. Following removal, long-term effectiveness for the alternative is continued by placement in a facility specially designed, constructed, and monitored to receive such wastes.
Reduction of Toxicity, Mobility, or Volume Through Treatment	Provides no reduction.	Reduces the mobility of contamination at the site by preventing soil erosion but does not reduce volume and toxicity. Does not reduce toxicity, mobility, or volume through treatment.	Reduces contaminant mobility by placement at a site better suited for containment. Does not reduce toxicity, mobility, or volume through treatment.
Short-Term Effectiveness	Would not involve short-term physical disturbances.	Would not involve short-term physical disturbances.	Workers would be protected during implementation of this alternative with monitoring, PPE, and engineering controls to mitigate concerns about fugitive dust emissions and storm-water management. Transport of hazardous materials or regulated substances is not considered dangerous; however, multiple modes of transport and multiple transfer points are involved, elevating risks to surrounding populations.
Implementability	No action taken.	This alternative is technically feasible and can be readily implemented.	Uses conventional equipment for excavation, transport, and disposal. Since this action involves movement of soil, verification of removal action objectives is straight forward. For disposal at a mainland CERCLA facility, minimal coordination with governmental agencies is involved, including the USDA, for export of soil. Ocean transport and disposal of hazardous wastes in another state involve additional administrative procedures. The procedures for pre-shipment acceptance manifest requirements and transport and disposal are reliable and easily implemented. Export of waste soil, sludge/fines, and liquid wastes requires additional administrative procedures including coordinating with the USDA. Currently, no facility on Oahu is approved to accept CERCLA waste.

Criterion	Alternative 1: No Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Media (no LUCs)
Cost	**$0**	**$2,244,000**	**$ 4,357,000 (mainland disposal)**
Modifying Criteria			
Projected Regulatory Agency Acceptance	It is unlikely that regulatory agencies would accept the no action alternative because it does not mitigate potential risks from impacted soil.	Regulatory agencies generally prefer treatment technologies that chemically destroy or alter contaminants. Therefore, regulators may view this alternative as less favorable than alternatives that employ treatment. Additional response actions may be required at the site if the regulators do not concur that the action serves as a final response action.	Regulatory agencies generally prefer treatment technologies that chemically destroy or alter contaminants. Therefore, regulators may view this alternative as less favorable than alternatives that employ treatment. Regulatory agencies generally prefer alternatives that do not involve off-island disposal if on-island options are available.
Projected Community Acceptance	It is anticipated that the public would not find this alternative acceptable.	It is anticipated that the public would find this alternative acceptable. However, additional response actions may be required at the site if the public does not concur that the action serves as a final response action.	It is anticipated that the public would find this alternative acceptable.

Table 8: Response Action Alternative Ratings

Criterion	5-Tiered Scale [b]	Alternative 1: No Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Media (no LUCs)
Threshold Criteria				
Overall Protectiveness of Public Health/Environment	Excellent if highly protective Poor if not protective	Poor	Very Good (is protective)	Excellent
Compliance with ARARs	Excellent if alternative complies with all ARARs Poor if alternative does not comply with all ARARs	Poor	Excellent	Excellent
Primary Balancing Criteria				
Long-Term Effectiveness and Permanence	Excellent if highly effective Poor if not effective	Poor	Very Good (is effective)	Excellent
Reduction of Toxicity, Mobility, or Volume Through Treatment	Excellent if reduces all contaminants Poor if no reduction	Poor	Poor	Poor
Short-Term Effectiveness	Excellent if highly effective Poor if not effective	Very Good (is effective)	Very Good (is effective)	Good (effective, but some potential for exposure occurs during soil removal)
Implementability	Excellent if highly feasible and available Poor if not feasible and available	Excellent	Excellent	Excellent
Capital Cost[a]	Excellent if < $1,000,000 Good if < $3,000,000 Poor if > $4,000,000	Excellent	Good	Poor
Modifying Criteria				
Regulatory Agency Acceptance	Excellent if highly acceptable Poor if not acceptable	To be determined [c]	To be determined [c]	To be determined [c]
Public Acceptance	Excellent if highly acceptable Poor if not acceptable	To be determined [c]	To be determined [c]	To be determined [c]
Overall Ranking		Poor [d]	Very Good	Very Good

[a] See detailed cost estimates in Appendix B.
[b] The 5-tiered scale is a subjective scale that includes the following categories in decreasing order used to indicate the degree to which criteria are met: Excellent, Very Good, Good, Fair, and Poor.
[c] To be determined based on regulator and public comments on the FFS report and proposed plan. Criteria will be addressed in the ROD.
[d] Ranked “Poor” because alternative does not meet the threshold criteria.

Attachment A-2
Former Bldgs. 80 and 302 Focused Feasibility Study
Alternatives Comparison Tables

Table 8: Identification of Action Alternatives

Alternative 1: No Further Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Soil (no LUCs)
• No action is taken at site.	• **Site engineering controls will remain in place including:** – Existing asphalt and coral paved areas west of Independence Street – Existing permeable and vegetative soil cap (constructed of clean soil) located east of Independence Street (constructed during 2006 TCRA) – Excavated areas and the area where the permeable and vegetative cap are constructed and restored. • **Institutional (legal) controls placed in Navy land use registries include:** – Land use restrictions (restricting the site to commercial/ industrial land use only) and running in perpetuity or until no longer necessary – Notice of site contamination and land use restrictions – Right of access for purposes of site inspection and further response action, if necessary • **Long-term maintenance and reporting** includes: – Long-term monitoring and maintenance of soil cap to ensure its integrity and continued effectiveness. – CERCLA five-year reviews to ensure that cap is not disturbed and site remains protective.	• Standard earth-moving equipment (e.g., backhoe or excavator) excavates remaining soil contaminated with metals concentrations above background levels. Total soil removal volume is estimated to be 4,700 cubic yards. • Confirmation samples are collected at sites to verify attainment of the target cleanup goals. • Excavated areas are backfilled with clean, on-island soil and revegetated. • Excavated areas are restored. • Excavated soil is containerized for shipment and disposal at a disposal facility approved to accept CERCLA remediation waste. • No CERCLA five-year reviews are required. • No LUCs are required since site becomes suitable for residential land use. • No long-term monitoring or maintenance is required.

Table 10: Evaluation of Response Action Alternatives

Criterion	Alternative 1: No Further Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Soil (no LUCs)
Threshold Criteria			
Overall Protection of Human Health and Environment	Provides no protection of human health and the environment.	Provides protection of human health and the environment because the contaminated surface soil is consolidated under a soil cap. The cap prevents direct exposure to impacted soil, protecting human and ecological receptors. The cap also minimizes surface soil erosion and reduces storm water runoff infiltration, reducing impacts to groundwater.	Provides protection of human health and the environment by removing all impacted soil. Increases the mass of waste material at the disposal facility, which is mitigated by placement in a facility specially designed to receive the waste and monitoring to ensure long-term containment of the waste. Additional audits performed by the EPA, as part of the CERCLA Off-Site Rule, further ensure protection of public health and environment.
Compliance with ARARs	Does not comply with the identified ARARs and TBC criteria.	Complies with the identified ARARs and TBC criteria.	Complies with the identified ARARs and TBC criteria. Because this is an offsite action, the disposal facility must be approved under CERCLA's Off-Site Rule; LDRs and MTRs are applicable and depend on the waste classification.
Primary Balancing Criteria			
Long-Term Effectiveness and Permanence	Provides no long-term effectiveness.	Attains long-term effectiveness. However, contaminated soil will remain in place at the site, requiring implementation of land use controls and five-year reviews as long as contamination remains at the site, in order to ensure that the contaminated areas are not disturbed or potential routes for exposure created due to future land use changes.	Attains long-term effectiveness and permanence because waste materials are removed from the site. Following removal, long-term effectiveness for the alternative is continued by placement in a facility specially designed, constructed, and monitored to receive such wastes.
Reduction of Toxicity, Mobility, or Volume Through Treatment	Provides no reduction.	Reduces the mobility of contamination at the site by preventing soil erosion but does not reduce volume and toxicity. Does not reduce toxicity, mobility, or volume through treatment.	Reduces contaminant mobility by placement at a site better suited for containment. Does not reduce toxicity, mobility, or volume through treatment.
Short-Term Effectiveness	Would not involve short-term physical disturbances.	Would not involve short-term physical disturbances.	Workers would be protected during implementation of this alternative with monitoring, PPE, and engineering controls to mitigate concerns about fugitive dust emissions and stormwater management. Transport of hazardous materials or regulated substances is not considered dangerous; however, multiple modes of transport and multiple transfer points are involved, elevating risks to surrounding populations.

Criterion	Alternative 1: No Further Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Soil (no LUCs)
Implementability	No action taken.	This alternative is technically feasible and can be readily implemented.	Uses conventional equipment for excavation, transport, and disposal. Since this action involves movement of soil, verification of response action objectives is straightforward. Excavated soil will be disposal of at a disposal facility approved to accept CERCLA remediation waste, either on Oahu or the mainland. Currently, there is no disposal facility on Oahu that is approved to accept CERCLA waste. However, one Oahu facility is in the process of obtaining EPA approval to accept CERCLA waste. For disposal at a mainland CERCLA facility, minimal coordination with governmental agencies is involved, including the USDA, for export of soil. Ocean transport and disposal of hazardous wastes in another state involve additional administrative procedures. The procedures for pre-shipment acceptance manifest requirements and transport and disposal are reliable and easily implemented. Export of waste soil, sludge/fines and liquid wastes requires additional administrative procedures including coordinating with the USDA.
Cost	**$0**	**$ 237,263**	**$ 4,766,292 (mainland disposal)**
Modifying Criteria			
Regulatory Agency Acceptance	It is unlikely that regulatory agencies will accept the no action alternative because it does not mitigate potential risks from impacted soil. Final assessment of regulatory acceptance will be addressed in the ROD.	Regulatory agencies generally prefer treatment technologies that chemically destroy or reduce the toxicity of contaminants. Therefore, regulators may view this alternative as less favorable than alternatives that employ treatment. Final assessment of regulatory acceptance will be addressed in the ROD.	Regulatory agencies generally prefer treatment technologies that chemically destroy or reduce the toxicity of contaminants. Therefore, regulators may view this alternative as less favorable than alternatives that employ treatment. However, this alternative eliminates potential health risks at the site. Regulatory agencies also generally prefer alternatives that do not involve off-island disposal if on-island options are available. Final assessment of regulatory acceptance will be addressed in the ROD.
Community Acceptance	It is anticipated that the public will not find this alternative acceptable. Final assessment of public acceptance will be addressed in the ROD.	It is anticipated that the public will find this alternative acceptable. Final assessment of public acceptance will be addressed in the ROD.	It is anticipated that the public would find this alternative acceptable. Final assessment of public acceptance will be addressed in the ROD.

LDRs land disposal restriction
MTRs minimum technology requirements
PPE personal protective equipment
USDA United States Department of Agriculture

Table 11: Response Action Alternative Ratings

Criterion	5-Tiered Scale[b]	Alternative 1: No Further Action	Alternative 2: LUCs	Alternative 3: Removal of Remaining Contaminated Soil (no LUCs)
Threshold Criteria				
Overall Protectiveness of Public Health/Environment	Excellent if highly protective Poor if not protective	Poor	Very Good (is protective)	Excellent
Compliance with ARARs	Excellent if alternative complies with all ARARs Poor if alternative does not comply with all ARARs	Poor	Excellent	Excellent
Primary Balancing Criteria				
Long-Term Effectiveness and Permanence	Excellent if highly effective Poor if not effective	Poor	Very Good (is effective)	Excellent
Reduction of Toxicity, Mobility, or Volume Through Treatment	Excellent if reduces all contaminants of concern Poor if no reduction	Poor	Poor	Poor
Short-Term Effectiveness	Excellent if highly effective Poor if not effective	Very Good (is effective)	Very Good (is effective)	Good (effective, but some potential for exposure occurs during soil removal)
Implementability	Excellent if highly feasible and available Poor if not feasible and available	Excellent	Excellent	Excellent
Capital Cost[a]	Excellent if < $1,000,000 Poor if > $4,000,000	Excellent	Excellent	Poor
Modifying Criteria				
Regulatory Agency Acceptance	Excellent if highly acceptable Poor if not acceptable	To be determined[d]	To be determined[d]	To be determined[d]
Public Acceptance	Excellent if highly acceptable Poor if not acceptable	To be determined[d]	To be determined[d]	To be determined[d]
Overall Ranking		**Poor**[c]	**Very Good**	**Very Good**

[a] See detailed cost estimates in Appendix D.
[b] The 5-tiered scale is a subjective scale that includes the following categories in decreasing order used to indicate the degree to which criteria are met: Excellent, Very Good, Good, Fair, and Poor.
[c] Ranked "Poor" because alternative does not meet the threshold criteria
[d] To be determined based on regulator and public comments on the FFS report and proposed plan. Criteria will be addressed in the ROD.

Attachment B
Responsiveness Summary

Table B-1: Responses to Public Comments

Comment No.	Question/Comment
Questions and Comments Received During the Proposed Plan Meeting (5 March 2008)	
1	Steve Mow, a representative from the Hawaii Department of Health (DOH) asked a question regarding the costs presented in Table 3 of the proposed plan. He asked how operation and maintenance of a cap could cost $1.2 million and indicated the cost seemed pretty expensive for a cap.
The Navy indicated that the cost estimate is for 30 years and includes groundwater monitoring.	
2	The DOH representative questioned if 30 years of groundwater monitoring were actually that high.
The Navy indicated that once costs for sampling, analyses, and reporting are factored in and converted to present value, the costs are what is presented.	
3	The DOH representative asked if on-island landfill PVT now accepts CERCLA waste.
The Navy indicated that PVT has approval to accept CERCLA waste.	
4	The DOH representative asked if the Navy evaluated the costs to dispose of the contaminated soil at PVT. For example, what if Alternative 3 were selected and the contaminated soil and debris were disposed of at PVT. Does the Navy know how much that would cost?
The Navy indicated that the calculation to perform disposal at PVT was not performed, but the Navy indicated that the cost for disposing CERCLA waste at PVT landfill is not known at this time. PVT is developing their procedures and has not provided final fees as the costs are changing.	
5	The DOH representative indicated that the reason he brings up these two points together is that if you look at Bldg. 284, for example, and you find that removing it is worth $2 million, wouldn't you want to remove it totally and never have to monitor it again?
The Navy indicated that eliminating the need to monitor would definitely factor in the alternatives evaluation, but the Navy also has to take a good look at the actual cost. There are a lot of different factors with that can change the construction cost.	
6	The DOH representative indicated that when you look at the overall ranking for Alternative 2 and Alternative 3, one is just as good as the other even with the cost difference. Both alternatives have an overall ranking of "very good; "therefore, one could argue that either alternative could be selected right now.
The Navy noted that the costs for Alternative 3 would be less, but at the time cleanup actions were implemented PVT did not have approval to accept CERCLA waste. The Navy noted that the estimated costs are also based on numerous assumptions	
7	The DOH representative indicated that if he were the public and two alternatives rated the same, he would pick the alternative that takes all waste away for good.
The Navy indicated that the costs were significantly different and alternative 3 for both sites would cost approximately $9 million at the time cleanup was conducted versus $2.5 million for alternative 2.	
8	The DOH representative indicated that the overall ranking for Alternative 3 should have been less based on the cost difference.
The Navy concurred.	
9	The DOH representative indicated that he still is not sure of the rankings. He also indicated that the remedy will be re-evaluated at the five-year review. During the five-year review, the appropriateness of the remedy will be evaluated and a decision can be made to implement a better remedy if appropriate. Hopefully, the landfill can provide fee before the five-year review.
The Navy indicated that they will see how the local landfill issues are resolved, and indicated that the DOH representative made a good point. The Navy also indicated that they assume the landfill fee would be set by the five-year review.	

Attachment C
Detailed Reference Table

Table C-1: Detailed Reference Table

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
1	Bldg. 284 Site	Section 1.3 Page 1	Focused Feasibility Study, Building 284 Slope, Ford Island, Hawaii, Appendix B, Section 4, page 4-1 through 4-6, Earth Tech, September 2007a.
2	Former Bldgs. 80 and 302 Site	Section 1.3 Page 1	Final Remediation Verification Report, Removal Action at Former Buildings 80 and 302, Ford Island, Pearl Harbor, Hawaii, Appendix N, Section 5, page 5-1, Dawson Group, Inc. (Dawson), November 2007.
3	Bldg. 284	Section 1.3 Page 1	Site Photo. Not in Administrative Record.
4	Former Bldgs. 80 and 302	Section 1.3 Page 1	Site Photo. Not in Administrative Record.
5	Bldg. 284 Site	Section 2.1.2.2 Page 14	Performance Design Package, Building 284 Slope, Ford Island, Pearl Harbor, Hawaii, Section 2, pages 3-6, Earth Tech, June 2006b
6	Bldgs. 80 and 302 Site	Section 2.1.2.2 Page 14	Design Addendum, Performance Design Package, Former Buildings 80 and 302, Ford Island, Pearl Harbor, Hawaii, Section 2, pages 2 and 3, Earth Tech, June 2006a.
7	Bldg. 284 Site	Section 2.1.2.2 Page 14	Focused Feasibility Study, Building 284 Slope, Ford Island, Hawaii, Executive Summary, pages iii-iv, Earth Tech, September 2007a.
8	Former Bldgs. 80 and 302 Site	Section 2.1.2.2 Page 14	Focused Feasibility Study, Building 80 and 302, Ford Island, Hawaii, Executive Summary, pages iii-iv, Earth Tech, September 2007b.
9	PP	Section 2.1.2.2 Page 14	Proposed Plan, Bldg. 284 and Former Buildings 80 and 302, Ford Island, Hawaii, DON 2008.
10	biological resources	Section 2.1.5.2 Page 16	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 2.4, pages 2-3 through 2-6, Earth Tech, February, 2003c.
11	Groundwater classification	Section 2.1.5.5 Page 18	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 2.8.4, pages 2-22 through 2-24, Earth Tech, February 2003c.
12	1942	Section 2.2.2.1 Page 19	Environmental Baseline Survey, Ford Island Geographical Study Area, Pearl Harbor Naval Complex, Oahu, Hawaii. Appendix A, Earth Tech. February, 2003b.
13	1952	Section 2.2.2.1 Page 19	Environmental Baseline Survey, Ford Island Geographical Study Area, Pearl Harbor Naval Complex, Oahu, Hawaii., Appendix A, Earth Tech. February, 2003b.
14	no further action	Section 2.2.3.1 Page 20	Record of Closure Addendum, NSFI-78 through NSFI-82, Hawaii. Section 5, page 5-1, PACNAVFACENGCOM, December 1998.
15	no further action	Section 2.2.3.1 Page 20	Record of Closure Addendum, NSFI-90, Hawaii. Section 5, page 5-1, PACNAVFACENGCOM, December 1998.
16	transferred from the DOH Solid and Hazardous Waste Branch, UST Section to the DOH Hazard Evaluation and Emergency Response Office	Section 2.2.3.1 Page 20	Letter from Hawaii Department of Health to Navy Region Hawaii, December 2006. Reference U1209SF.
17	human health preliminary risk evaluation	Section 2.2.3.2 Page 20	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 5.9.3.2, pages 5-133 through 5-136, Earth Tech, February 2003c.
18	ecological screening risk assessment	Section 2.2.3.2 Page 20	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 5.9.3.3, pages 5-136 through 5-140, Earth Tech, February 2003c.
19	soil removal action was recommended	Section 2.2.3.2 Page 20	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 5.9.4, page 5-140, Earth Tech, February 2003c.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
20	transformer TB-01 site	Section 2.2.3.2 Page 21	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 3.9, pages 3-23 through 3-24, Earth Tech, February 2003c.
21	removal site evaluation	Section 2.2.3.4 Page 21	Focused Feasibility Study, Bldg. 284 Slope, Ford Island, Hawaii, Section 4, pages 11-29, Earth Tech, September 2007a.
22	soil cap	Section 2.2.3.5 Page 22	Performance Design Package, Buildings 284 Slope, Ford Island, Pearl Harbor, Hawaii, NAVFAC Drawing No. 7507057 - 7507060, Earth Tech. June 2006b.
23	revetment	Section 2.2.3.5 Page 22	Performance Design Package, Buildings 284 Slope, Ford Island, Pearl Harbor, Hawaii, NAVFAC Drawing No. 7507061- 7507062, Earth Tech. June 2006b.
24	post-removal risk assessment	Section 2.2.6 Page 26	Focused Feasibility Study, Bldg. 284 Slope, Ford Island, Hawaii, Post-Removal Risk Assessment, Section 4, page 4-1 through 4-6, Earth Tech, September 2007a.
25	recommendations from EPA Region 9	Section 2.2.6 Page 26	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii, Appendix U.2, Earth Tech, February 2003c
26	SRA	Section 2.3.3.1 Page 30	Remedial Investigation Report, Ford Island, Pearl Harbor, Hawaii. Section 5.8.3.3, page 5-116, Earth Tech, February 2003c.
27	additional delineation sampling	Section 2.3.3.2 Page 33	Focused Feasibility Study, Building 80 and 302, Ford Island, Hawaii, Section 1.3, pages 10-18, Earth Tech, September 2007b.
28	TCRA	Section 2.3.3.3 Page 33	Focused Feasibility Study, Building 80/302, Ford Island, Hawaii, Section 1.4.4 and 1.4.5, pages 10-18, Earth Tech, September 2007.
29	vegetative soil cap	Section 2.3.3.3 Page 33	Design Addendum, Performance Design Package, Former Buildings 80 and 302 IR Site, Ford Island, Pearl Harbor, Hawaii, NAVFAC Drawing No. 7506816, Earth Tech, June 2006a.
30	human	Section 2.3.6 Page 35	Final Remediation Verification Report, Removal Action at Former Buildings 80 and 302, Ford Island, Pearl Harbor, Hawaii, Appendix N, Section 4.1, pages 4-1 through 4-19, Dawson Group, Inc. (Dawson), February 2007.
31	ecological	Section 2.3.6 Page 35	Final Remediation Verification Report, Removal Action at Former Buildings 80 and 302, Ford Island, Pearl Harbor, Hawaii, Appendix N, Section 4.2, pages 4-19 through 4-20, Dawson Group, Inc. (Dawson), February 2007.
32	nine criteria	Section 2.4.3 Page 40	Focused Feasibility Study, Bldg. 284 Slope, Ford Island, Hawaii, Section 3.2, page 22, Earth Tech, September 2007a.
33	Table 7	Section 2.4.3 Page 40	Focused Feasibility Study, Bldg. 284 Slope, Ford Island, Hawaii, Table 7, page 24, Earth Tech, September 2007a.
34	Table 10	Section 2.4.3 Page 40	Focused Feasibility Study, Bldg. 80/302, Ford Island, Hawaii, Table 10, page 42, Earth Tech, September 2007b.
35	Table 8	Section 2.4.3 Page 40	Focused Feasibility Study, Building 284, Ford Island, Hawaii, Table 8, page 27, Earth Tech, September 2007a.
36	Table 11	Section 2.4.3 Page 40	Focused Feasibility Study, Building 80/302, Ford Island, Hawaii, Table 11, page 44, Earth Tech, September 2007b.
37	Appendix C	Section 2.4.5.4 Page 42	Focused Feasibility Study, Bldg. 284 Slope, Ford Island, Hawaii, Cost Estimate Summary Table, Appendix C, Earth Tech, September 2007a.
38	Appendix D	Section 2.4.5.4 Page 42	Focused Feasibility Study, Building 80/302, Ford Island, Hawaii, Cost Estimate Summary Table, Appendix D, Earth Tech, September 2007b.
39	300.430(a)(1)(iii)(A)	Section 2.4.6.5 Page 44	40 Code of Regulations 300.430[a][1][iii][A], National Oil and Hazardous Substances Pollution Contingency Plan, Subpart E– Hazardous Substance Response, § 300.430 Remedial investigation/feasibility study and selection of remedy