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Record of Decision
Former Manana Storage Area
PEARL CITY, OAHU, HAWAII

September 2006

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

Comprehensive Long-Term Environmental Action Navy
Contract Number N62742-94-D-0048, CTO 0071

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Prepared for:

Department of the Navy
Commanding Officer
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400 Marshall Road
Pearl Harbor, HI 96860-3139

Prepared by:

Earth Tech, Inc.
841 Bishop Street, Suite 500
Honolulu, HI 96813-3920

Prepared under:

Comprehensive Long-Term Environmental Action Navy
Contract Number N62742-94-D-0048, CTO 0071

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
Bldg.	Building
BWS	Board of Water Supply, City and County of Honolulu
CCH	City and County of Honolulu
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	community involvement plan
cm/sec	centimeter per second
COC	chemical of concern
COPC	chemical of potential concern
DOH	Department of Health, State of Hawaii
DON	Department of the Navy
DRMO	Defense Reutilization and Marketing Office
EBS	environmental baseline survey
EE/CA	engineering evaluation/cost analysis
EPA	Environmental Protection Agency, United States
EPC	exposure point concentration
FISC	Fleet and Industrial Supply Center
HI	hazard index
IAS	initial assessment study
ID	identification
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MSA	Manana Storage Area
NEESA	Naval Energy and Environmental Support Activity
NFA	no further action
NFESC	Naval Facilities Engineering Services Center
OHM	OHM Remediation Services Corp.
NAVFAC Hawaii	Naval Facilities Engineering Command, Hawaii
PA	preliminary assessment
PCB	polychlorinated biphenyl
PHNC	Pearl Harbor Naval Complex
PRE	preliminary risk evaluation
PRG	preliminary remediation goal
RA	removal action
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RGA	regional groundwater assessment
RI	remedial investigation
ROD	record of decision
SI	site inspection
SVOC	semivolatile organic compound
TFH	total fuel hydrocarbons
TPH	total petroleum hydrocarbons

VOC	volatile organic compound

1. Declaration

1.1 Site Name and Location

The former Manana Storage Area (MSA) (United States Environmental Protection Agency [EPA] Identification [ID]: HI41700900706; Operable Unit ID: 10) occupies a 109-acre parcel west of Waimano Home Road, approximately 0.4 miles northwest of the intersection with Kamehameha Highway in Pearl City, Oahu, Hawaii, approximately 1.2 miles northeast of the Pearl Harbor shoreline.

The former MSA is part of the Pearl Harbor Naval Complex (PHNC). The PHNC was added to the National Priorities List on October 14, 1992 after completion of Hazard Ranking System screening, public solicitation of comments, and after all comments had been addressed.

1.2 Statement of Basis and Purpose

Investigation results and analysis of verification samples, which were collected to verify cleanup after removal of contaminated soil from the former MSA, indicate that site cleanup goals have been achieved and that concentrations of chemicals of potential concern (COPCs) at the site are below levels that could threaten human health or the environment.

Therefore, the Navy, in conjunction with the State of Hawaii Department of Health (DOH) and EPA Region 9, selected no further action (NFA) as the final remedy for the former MSA. The final remedy was selected in accordance with the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA), after comparing COPC concentrations detected in soil and groundwater samples collected at and downgradient of the former MSA to risk-based screening criteria including EPA Region 9 preliminary remediation goals (PRGs). This decision is based on the Administrative Record File for the site.

This record of decision (ROD) satisfies CERCLA, DOH, and EPA Region 9 requirements. DOH and EPA Region 9 concur with the selected remedy by signature in Section 1.5.

1.3 Description of the Selected Remedy

In April 1996, the Navy conducted a removal action (RA), which included excavation of approximately 272 tons of arsenic-containing soil from 13 small pits in 6 areas at the former MSA. The excavated soil was disposed of at an approved offsite facility (PVT Land Co. Ltd./Nanakuli Landfill on Oahu). Results of the investigation and verification soil sampling conducted to verify successful completion of the RA indicated that the cleanup goals were achieved and that COPC concentrations in soil remaining at the site were below levels that could threaten human health or the environment (as described in Section 2).

Arsenic, the primary COPC at the former MSA, was not detected in groundwater underlying the site, and concentrations of other metals detected in the groundwater were well below their respective risk-based screening criteria. No organic compounds were detected in the groundwater. Based on the soil and groundwater investigation results, the Navy, in conjunction with the DOH and EPA Region 9, selected NFA as the final remedy for the former MSA. The monitoring wells have been abandoned and sealed to prevent future risk of contaminating the basal aquifer.

1.4 Statutory Determinations

Executive Orders 12080 and 12580 authorize the Navy to conduct environmental cleanup and remediation activities at Navy sites; therefore, the Navy is the lead agency for the former MSA.

The RA was successfully completed, and the investigation and verification sampling results indicate that COPC concentrations in soil remaining at the site are below levels that could threaten human health or the environment; therefore, the Navy has determined that NFA is protective of human health and the environment at the former MSA. The remedy selected for the former MSA complies with federal requirements that are applicable or relevant and appropriate, is cost-effective, and uses, to the maximum extent practicable, permanent solutions and alternative treatment technologies.

Five-year reviews are not required for the former MSA because the remedy did not result in hazardous substances, pollutants, or contaminants remaining on site at concentrations above levels that allow for unlimited use and unrestricted exposure.

1.5 AUTHORIZING SIGNATURES

The U.S. Navy and EPA Region 9 jointly select the remedy described in this ROD.

Clyde K. Yokota — 9/28/06

C.K. Yokota
Director, Regional Environmental Department
By direction of: Commander, Navy Region Hawaii

Date

Kathleen H. Johnson — 9/28/06

Kathleen H. Johnson
Chief, 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 ROD.

Laurence K. Lau — 9/28/06

Laurence K. Lau
Deputy Director of Environmental Health
State of Hawaii, Department of Health

Date

2. Decision Summary

2.1 SITE NAME, LOCATION, AND DESCRIPTION

As shown on Figure 1, the former MSA site is located in Pearl City, Oahu, Hawaii. The southern boundary of the site is approximately 1.2 miles northeast of the shoreline of the Middle Loch of Pearl Harbor. As shown on Figure 2, the site occupies a 109-acre parcel west of Waimano Home Road, approximately 0.4 miles northwest of the intersection with Kamehameha Highway.

Existing and former warehouse building locations and parcel boundaries at the former MSA are shown on Figure 3. For investigation purposes, the site was divided into Parcels A, B, and C. Parcel A consisted of 14 warehouse buildings (Buildings [Bldgs.] 1 through 14), 10 of which were demolished, leaving 4 remaining buildings (Bldgs. 9 [partial], 10 [partial], 13, and 14). Parcel B consisted of 15 warehouse buildings (Bldgs. 15 through 29), 12 of which were demolished, leaving 3 remaining buildings (Bldgs. 15, 16, and 18). Parcel C consisted of 11 warehouse buildings (Bldgs. 30 through 40), all of which were demolished.

The Navy is the lead agency for environmental site cleanup at the former MSA. Supporting agencies include DOH and EPA Region 9. Environmental investigations and response actions taken at the former MSA have been funded through the Navy's Installation Restoration Program.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section summarizes available historical information regarding the use of the former MSA site and describes previous site investigations and RAs.

2.2.1 Pre-Navy Activities at the Former MSA

Although land use at the former MSA property prior to 1944 is not well-documented, historical development maps, aerial photographs, and property ownership records indicate that the property was used for agricultural purposes (Ogden 1994b). The Honolulu Plantation Company leased the property for agricultural use during the early 1940s.

2.2.2 Navy Activities at the Former MSA

After the Navy acquired the MSA property in 1944, the Navy Fleet and Industrial Supply Center (FISC) constructed warehouses on the site. FISC and other Navy tenants used Parcels A, B, and C for general storage until approximately 1973.

In 1973, the Defense Reutilization and Marketing Office (DRMO) began operations at the site, including the collection, storage, and transfer of materials recovered from Pacific Rim military facilities. The DRMO used the warehouses on Parcels A and C primarily to store surplus records, supplies, and equipment. In 1980, the DRMO began to redistribute, transfer, sell, donate, and facilitate offsite disposal of both hazardous and non-hazardous materials located in Bldgs. 18 and 26 on Parcel B (NEESA 1988). Because both hazardous and non-hazardous materials were staged in warehouses and on open concrete foundations within Parcel B, various chemicals could have been released to the ground surface in this portion of the site. From 1982 until 1993, many of the warehouse buildings were demolished, and the concrete foundations were used as open storage areas (Ogden 1995).

In August 1993, the Department of the Navy entered into a memorandum of understanding to sell the former MSA to the City and County of Honolulu (CCH) (DON 1993). The Navy agreed to "deliver property free of all surface and subsurface hazardous materials, in accordance with the standards of

the Resource, Conservation, and Recovery Act (RCRA) 1976 as amended, the CERCLA of 1980 as amended, and applicable chapters 128D and 342J of the Hawaii Revised Statutes as amended."

2.2.3 Current Site Use

After the CCH acquired the property in 1993, various CCH agencies began to use the site for general warehouse and maintenance operations. A maintenance facility for The Bus transit system is currently located in the central portion of the site. After the RA was completed and cleanup was verified in 1996, the northeast corner of the site was redeveloped for use as a community park. The majority of the former MSA is zoned for a combination of light commercial and industrial development. In 2006, Wal-Mart Stores, Inc. opened a retail facility adjacent to the former Bldg. 1 area. Current site conditions at the former MSA are shown on Figure 4.

2.2.4 Previous Site Investigations and Removal Action

The investigations and RA documented in the reports listed below were performed to identify the nature and extent of contamination resulting from Navy activities at the former MSA, confirm that Navy activities at the site did not impact groundwater in the region, remove contaminated soil from the site, and verify that soil and groundwater at the site do not threaten human health or the environment:

- *Initial Assessment Study (IAS) of the Pearl Harbor Naval Base, Oahu, Hawaii.* (NEESA 1983)
- *Preliminary Assessment Report (PA), DRMO, Pearl Harbor, Hawaii, 96782-0580.* (NEESA 1988)
- *Environmental Baseline Survey (EBS) for Transfer for Manana Storage Area Fleet and Industrial Supply Center, Pearl Harbor, Hawaii* (Ogden 1994a)
- *Final Site Inspection (SI) Report, DRMO Manana Storage Area, CTO 0041, Volumes I and II* (Ogden 1994b)
- *Remedial Investigation (RI) Report for DRMO Manana Storage Area Fleet and Industrial Supply Center, Pearl Harbor, Pearl City, Hawaii* (Ogden 1995)
- *Engineering Evaluation/Cost Analysis (EE/CA) for DRMO Manana Storage Area Removal Action Fleet and Industrial Supply Center, Pearl Harbor, Hawaii* (Ogden 1996)
- *Final Remediation Verification Report, DRMO Manana Storage Area Removal Action, Excavation of Arsenic-Contaminated Soil, Fleet and Industrial Supply Center* (OHM 1996)
- *Regional Groundwater Assessment (RGA), Manana Storage Area and Pearl City Junction, Pearl City, Oahu, Hawaii* (Earth Tech 2003)

2.2.4.1 Initial and Preliminary Site Assessments

In 1983, the Naval Facilities Engineering Services Center (NFESC) performed an initial assessment study (IAS) of the Pearl Harbor Naval Base to locate and report hazardous materials stored or disposed of on base. The IAS report concluded that Parcels A and C at the former MSA were free of environmental contamination because no hazardous materials had been stored on these parcels. However, because DRMO activities conducted in buildings on Parcel B included storage and transfer of hazardous materials, Parcel B was identified as potentially contaminated (NEESA 1983).

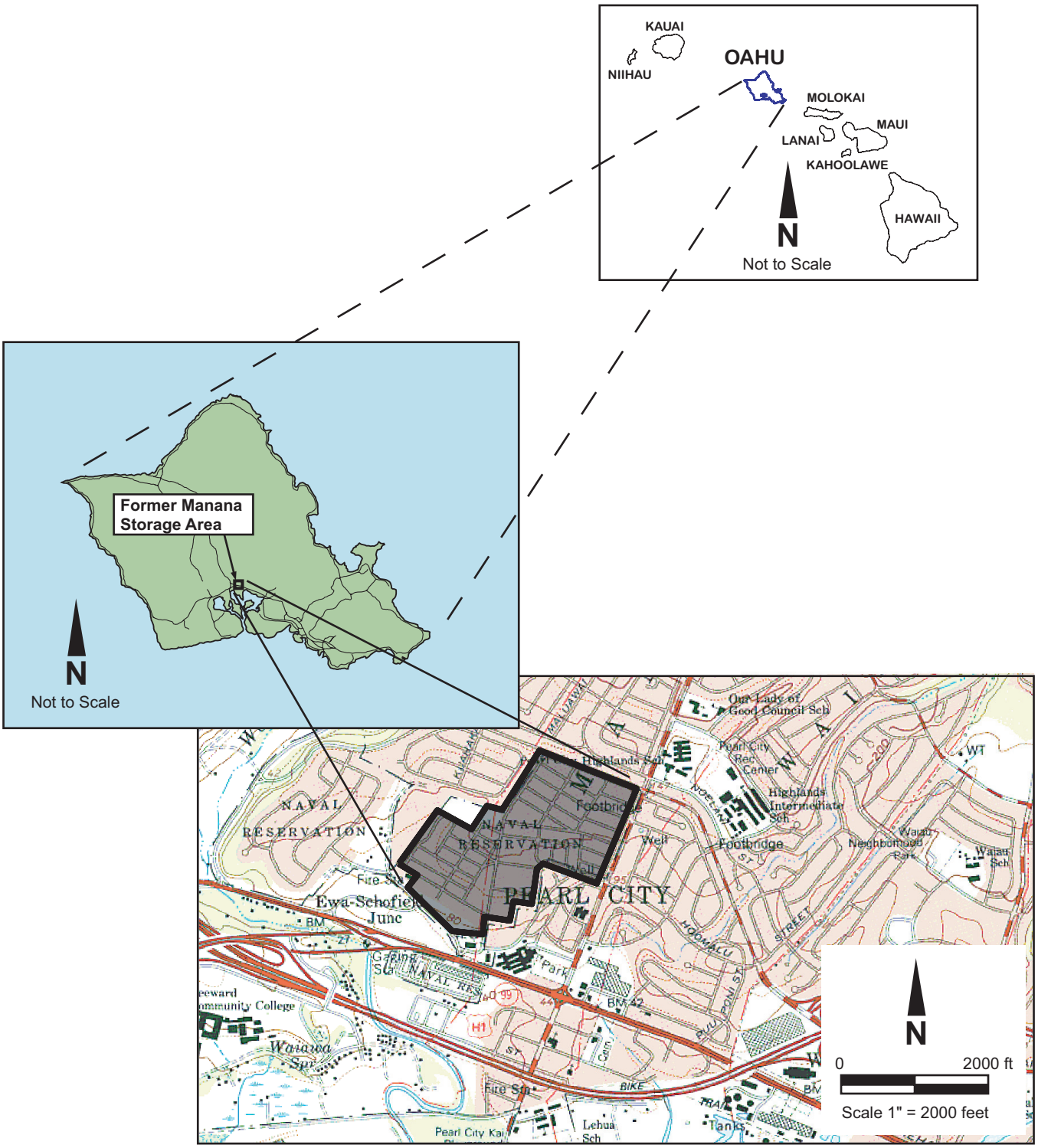

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Figure 1
Site Location Map
Former Manana Storage Area
Oahu, Hawaii

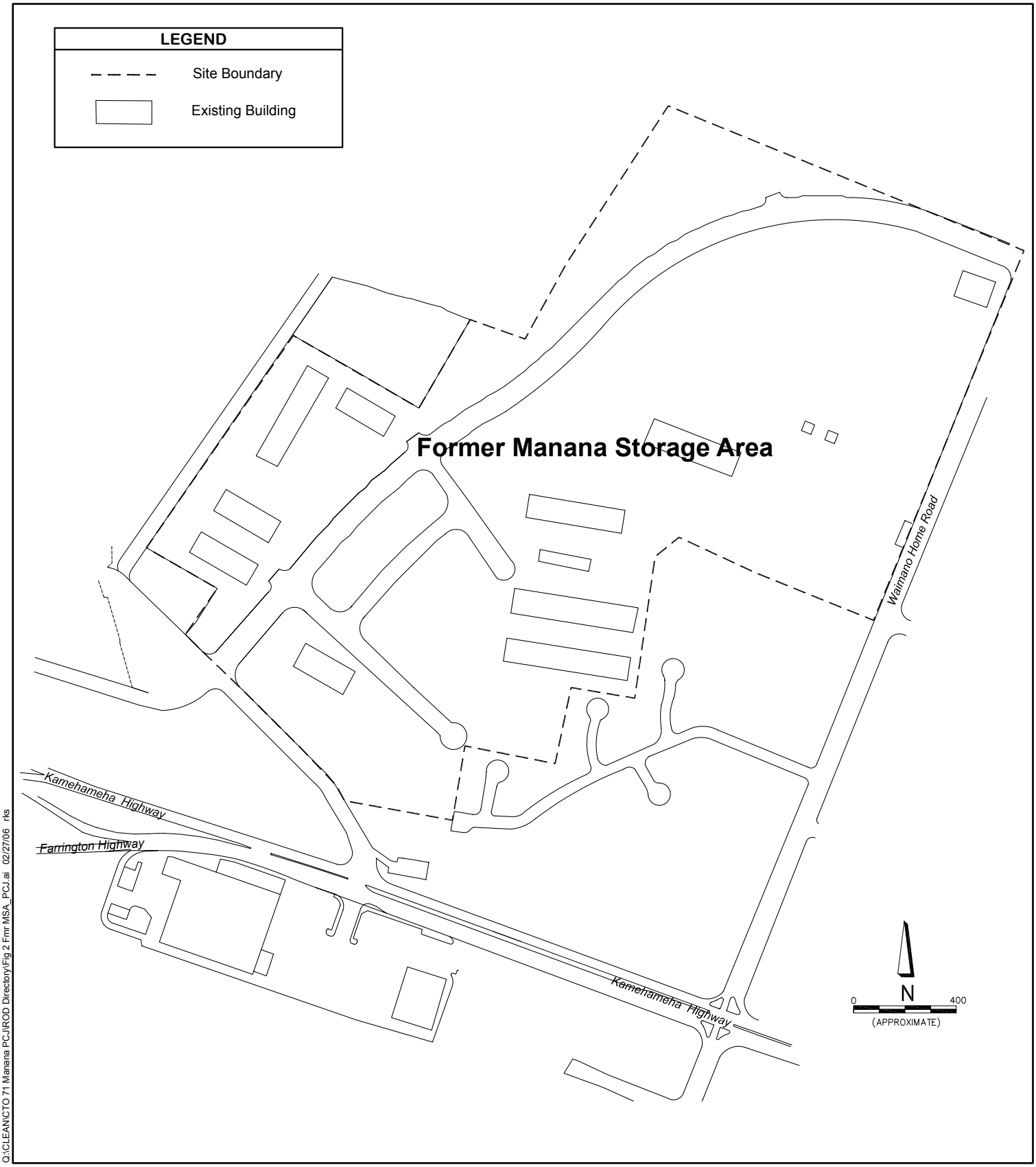

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Figure 2
Site Layout Map
Former Manana Storage Area
Oahu, Hawaii

LEGEND

	Demolished Building
	Existing Building
	Site Boundary
	Manana Storage Area Parcel Boundary
Bldg	Building

SOURCES

1. R.M. Towill (2002)
2. CCH (2003)
3. DLNR (1998)
4. OGDEN (1998)

N

0 400

SCALE 1"=400' (APPROXIMATE)

Figure 3
Demolished and Existing Warehouse Buildings and Parcel Boundaries
Areas of Concern
Former Manana Storage Area
Oahu, Hawaii

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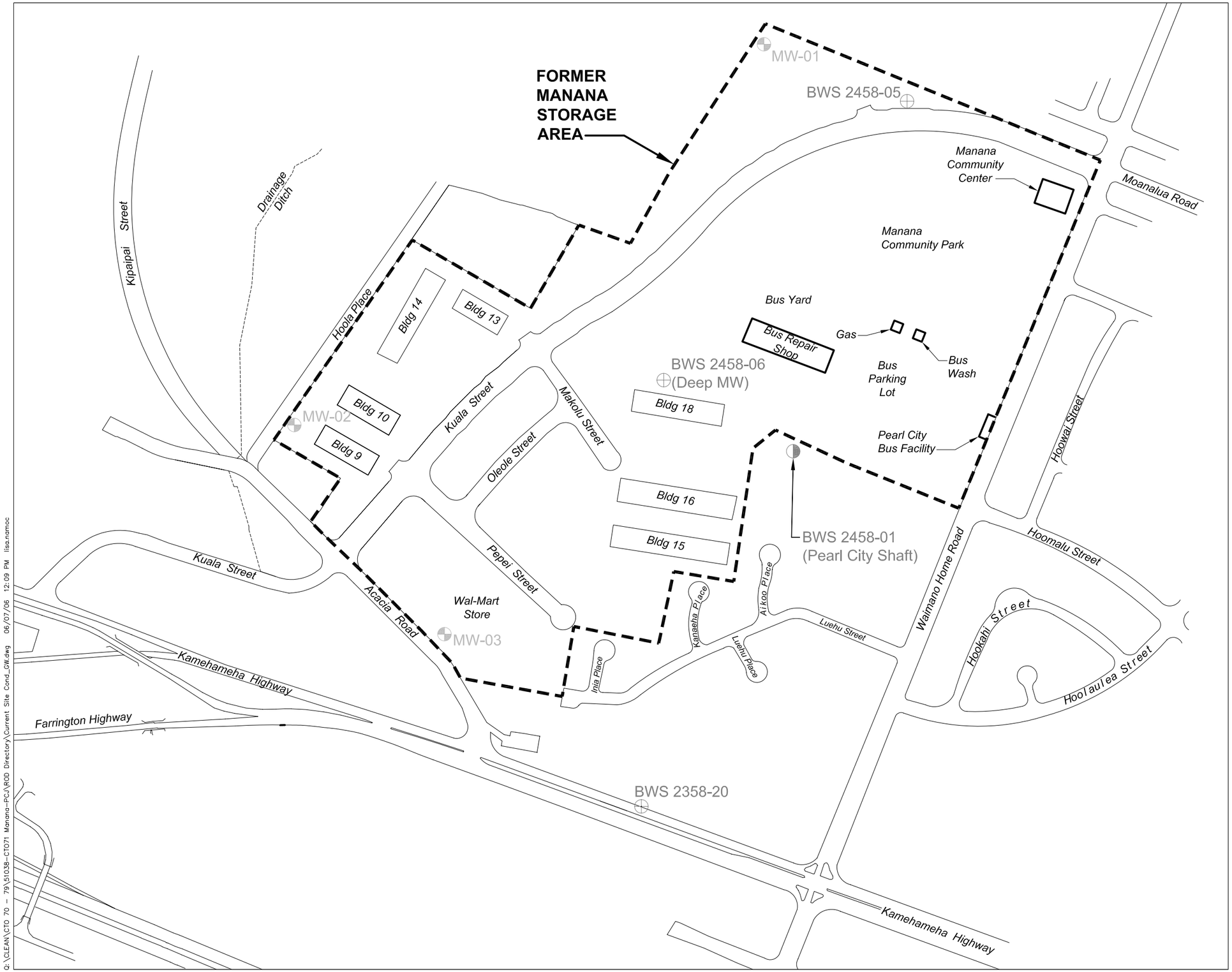

LEGEND

	Existing Building
	Site Boundary
MW-01	Former RGA Monitoring Well Location with Well Number (Abandoned)
BWS 2458-05	BWS Monitoring Well Location with Well Number
BWS 2458-01	BWS Production Well Location with Well Number
RGA	Regional Groundwater Assessment
BWS	Board of Water Supply

SOURCES

1. R.M. Towill (2002)
2. CCH (2003)
3. DLNR (1998)
4. OGDEN (1998)

N

0 400

SCALE 1"=400' (APPROXIMATE)

Figure 4
Current Site Conditions
and Groundwater Well Locations
Former Manana Storage Area
Oahu, Hawaii

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EPA Region 9 conducted annual RCRA inspections in 1985, 1986, and 1987. No incidents were reported in 1985; however, leaking drums were reported in 1986 and a leaking drum of pentachlorophenol was reported in 1987. In response to EPA concerns, NFESC personnel performed a Preliminary Assessment (PA) in August 1988 and reported minor substance leaks. However, hazardous wastes had been contained and removed by a licensed contractor for disposal at an approved offsite facility; therefore, the PA report recommended NFA for the former MSA (NEESA 1988). In 1991, interviews were conducted with long-term DRMO personnel who recalled leaking drums near the side of Bldg. 18, and drums, vehicles, and machinery stored in open areas.

2.2.4.2 Environmental Baseline Survey

An environmental baseline survey (EBS) was conducted in 1994 to facilitate sale of the former MSA to the CCH (Ogden 1994a). An EBS was required for the certification process to transfer the deed of the property. A leaking drum was identified on Parcel A. The drum was removed in July 1994, and the soil was analyzed for contamination. The analytical results indicated that the soil was not contaminated and no excavation was performed. NFA was recommended for Parcels A and C; however, Parcel B was identified as an area of environmental concern, and a RA was recommended before the property could be sold.

2.2.4.3 Site Inspection

The objectives of the site inspection (SI) were to assess the nature of onsite soil contamination and identify source areas, potential contaminant transport pathways, and receptor populations. Parcel B was identified as the area of concern based on previous DRMO activities at the site. Parcels A and C were assumed to be free of contamination because no hazardous materials were stored on these sites during DRMO activities. During the SI field activities in October 1991 and November 1992, shallow soil borings were advanced at 83 locations within Parcel B, and 250 soil samples were collected from the borings. The soil samples were analyzed for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), pesticides, herbicides, and carbamates (insecticides). Additional samples were collected from an undisturbed and undeveloped location to evaluate natural background metal concentrations (Ogden 1994b).

All soil samples collected during the SI contained detectable concentrations of VOCs and metals. Pesticide, herbicide, and total fuel hydrocarbon (TFH) concentrations were below detection limits. TPHs were detected in some samples. However, no EPA Region 9 PRG existed for this analyte; therefore, EPA Region 9 residential soil PRGs for petroleum indicator compounds (benzene, toluene, ethylbenzene, total xylenes, and benzo(a)pyrene) were used for screening purposes. None of the petroleum indicator compounds were detected at concentrations above the EPA Region 9 residential soil PRGs (EPA Region 9 1995). Chemicals that were detected at concentrations above the EPA Region 9 1995 PRGs were identified as chemicals of concern (COCs). Arsenic and lead were “definitively identified” as COCs because of numerous detections above both the PRGs and background levels. Antimony, beryllium, chromium, and thallium were detected at concentrations above the PRGs, but below background levels, and were identified as COPCs for consideration in future risk evaluations. Redevelopment of Parcel B was expected to include commercial/industrial use and residential use; however, specific future populations and receptors could not be determined with certainty. Therefore, a conceptual evaluation model including three potential onsite receptor populations was developed: 1) current onsite workers/visitors, 2) interim construction workers, and 3) future onsite residents. Potentially complete pathways for exposure were identified as air/dust ingestion, inhalation, and dermal contact for all receptors; ingestion and dermal contact with surface soil for all receptors; ingestion and dermal contact with subsurface soil for future construction workers and residents; and dermal contact with surface water for future construction workers and

residents. The SI concluded that significant hazardous substance releases were unlikely and that migration of the chemicals to the underlying groundwater was unlikely because of the low-permeability clay and silt sediments underlying the site. However, further action was recommended to characterize soils at depths less than 6 inches and greater than 6 feet, evaluate background metals concentrations, obtain information on potential future grading or construction operations, and evaluate potential risks to human health (Ogden 1994b).

2.2.4.4 REMEDIAL INVESTIGATION

The remedial investigation (RI) was conducted in two phases between August 1994 and September 1995. Phase I of the RI was designed to obtain the data required to support a human health baseline risk assessment, evaluate background metal concentrations, and assess the nature and extent of potential contamination in soil and groundwater downgradient of the site (Ogden 1995). During Phase I sampling in October and November 1994, 55 surface soil samples (sampling depth less than or equal to 0.5 feet below ground surface [bgs]) were collected from a square grid at 200-foot intervals, 66 subsurface soil samples were collected from 13 soil borings, and 5 soil samples were collected from a reference area for the background metals evaluation. Soil samples from the borings were collected at 5-foot depth intervals down to depths of 20 feet. Samples collected from depths greater than 20 feet were collected at 10-foot depth intervals. Soil samples for the background metals evaluation were collected from a reference area located in the northwestern corner of an open storage area. Aerial photographs suggest that this area (the same area used for background sampling during the SI) was not used during FISC operations at the site. In addition, the reference area is not located near areas that were potentially impacted during DRMO operations at the site.

Results of the Phase I soil sampling and analysis program indicated that arsenic, beryllium, and chromium concentrations in the soil were above 1995 EPA Region 9 PRGs (EPA Region 9 1995) for residential soil. Beryllium and chromium concentrations detected in the background samples were also above the PRGs, indicating that concentrations of these metals were most likely within the (naturally occurring) background range, and not likely associated with a chemical release. However, arsenic was detected in some of the Parcel B samples at concentrations well above the levels detected in the background reference samples, suggesting that arsenic was released to the soil in some areas within Parcel B. In addition, lead was detected at concentrations suggesting a site-related release in one area of the site.

Soil samples were collected during Phase II of the RI in February and March 1995 to define the volume and area of impacted soil in potential arsenic and lead hot spots identified during the previous investigation activities. Subsurface soil samples were collected at 2-foot depth intervals from 48 soil borings advanced at the potential hotspots.

The RI identified six exposure areas significantly impacted by arsenic; soil within a small portion of one of these areas was also significantly impacted by lead (significant impact is defined by concentrations above both the EPA Region 9 residential soil PRGs and background concentrations). The baseline risk assessment evaluated three exposure scenarios (current residential, future residential, and hypothetical construction) and complete pathways for potential exposure of onsite workers, visitors, and residential receptors to surface and subsurface soil in the six exposure areas. Industrial exposure scenarios were not evaluated because direct contact with surface soils would not pose a cancer risk, and industrial receptors would not contact subsurface soils. The results of the baseline risk assessment indicated that arsenic was the risk driver at five of the hotspots, and lead was the risk driver at one of the hotspots (Ogden 1995).

One organic compound, dieldrin, was detected in one of the Phase II soil samples at a concentration (0.0296 milligrams per kilogram [mg/kg]) above the 1995 EPA Region 9 PRG value for dieldrin in

residential soil (0.028 mg/kg) (EPA Region 9 1995). Because the dieldrin concentration was only slightly above the 1995 PRG value, and no other organic COPCs were detected in any of the samples at concentrations above the 1995 EPA Region 9 residential PRGs, the RI report concluded that soil at the former MSA was not significantly impacted with organic chemicals. The residential soil PRG for dieldrin increased to 0.03 mg/kg in 2004 (EPA Region 9 2004). The detected concentrations of dieldrin and all other organic COPCs are below the current residential soil PRGs (EPA Region 9 2004). Based on summation of reasonable maximum exposure risks, the baseline risk assessment concluded that risks to human health associated with exposure to soil at the former MSA were low to moderate (Ogden 1995).

Based on the SI and RI results, it was concluded that soil in five areas was impacted with arsenic at depths between 1 and 4 feet bgs, and that soil in one area was impacted with lead at depths between 1 and 1.5 feet bgs. A RA was therefore recommended to remove the impacted soil as necessary to reduce risk to human receptors to acceptable levels.

During the RI in 1994 and 1995, surface water and groundwater samples were collected and analyzed to evaluate runoff patterns and the potential for contaminant migration (Ogden 1995). Potential pathways for migration of contaminants with surface water were assessed by inspecting drainage patterns and reviewing storm water drainage reports. Groundwater samples were collected from two Board of Water Supply, CCH (BWS) wells located outside the boundaries of the former MSA (Figure 4):

- BWS 2458-01 (Pearl City Shaft), located on BWS property near the east-central portion of the former MSA
- BWS 2358-20, located adjacent to Kamehameha Highway near Pearl City Elementary School, southeast of the former MSA boundary

Three groundwater samples were collected from BWS well 2458-01 during Phase I, and one groundwater sample was collected from BWS well 2358-20 during Phase II. The groundwater samples were analyzed for VOCs, SVOCs, organochlorine pesticides/PCBs, chlorinated herbicides, TFH, and metals. Metals (arsenic, copper, lead, and zinc) were the only COPCs detected in the groundwater samples, and all detected concentrations were below drinking water standards (maximum contaminant levels [MCLs] [EPA 2003]). Therefore, the RI report (Ogden 1995) concluded that Navy operations at the former MSA had no impact on the underlying groundwater.

2.2.4.5 Removal Action

Based on the results of the SI and RI, an engineering evaluation/cost analysis (EE/CA) was prepared to evaluate RA alternatives to address arsenic- and lead-contaminated soil. The Navy contracted OHM Remediation Services Corp. (OHM) to conduct a non-time-critical RA in March and April 1996. OHM excavated and disposed of arsenic- and lead-contaminated soil from 13 isolated locations within the 6 exposure areas, as illustrated in Figure 5, identified during the RI. As recommended in the EE/CA (Ogden 1996), soil was removed to achieve cleanup goals based on 1995 EPA Region 9 residential soil non-cancer PRG values for arsenic (22 mg/kg). Verification samples were collected from the center of the excavation and base of the four side walls. If the arithmetic mean of the arsenic concentrations detected in the verification samples was below the PRG, the area was considered sufficiently remediated, and the excavation was deemed complete. If the mean arsenic concentration exceeded the arsenic PRG, the excavation was expanded and verification sampling was repeated until the mean concentration was below 22 mg/kg (OHM 1996). Because the small area impacted by lead was included within one of the areas excavated to cleanup arsenic, it was not necessary to analyze the verification samples for lead. A total of approximately

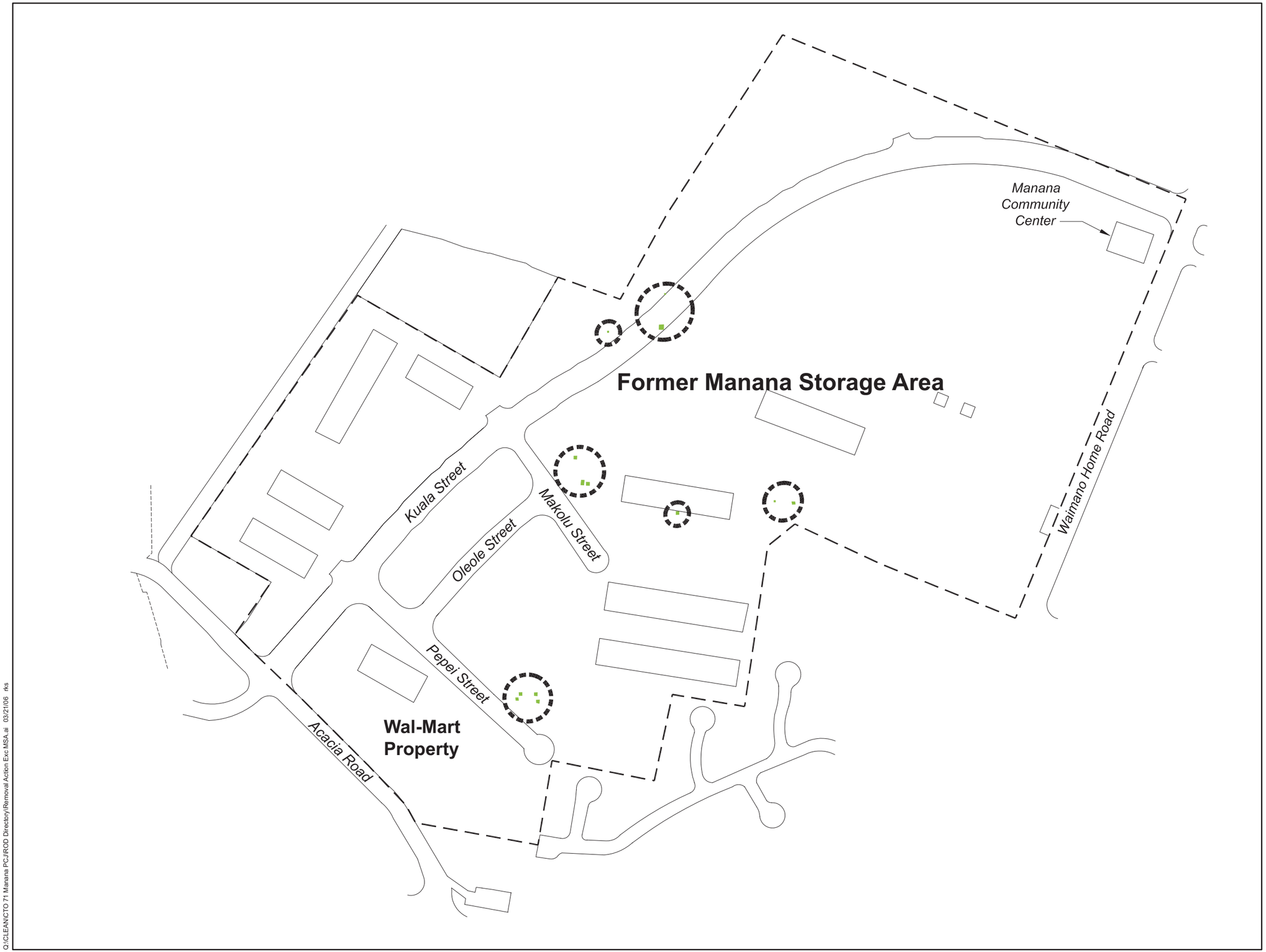
272 tons of soil was removed from the 13 excavations, which reached maximum dimensions of approximately 15-by-15 feet horizontally, and 4.5 feet bgs. The excavated soil was disposed of at an approved offsite facility. The excavated areas were backfilled with clean fill material after the EPA and DOH reviewed and approved the Navy's remediation verification report (OHM 1996).

2.2.4.6 REGIONAL GROUNDWATER ASSESSMENT

A regional groundwater assessment (RGA) was conducted from 2001 to 2003 after the completion of the RA (OHM 1996) at the former MSA. The objective of the RGA was to confirm that chemicals released at the former MSA did not impact, and are not likely to impact, groundwater beneath or downgradient of the site. The RGA objectives included confirming the conclusions of previous investigations and the effectiveness of the RA. To address these objectives, groundwater chemical data and hydrogeologic information were collected and evaluated to identify potential site-related contamination and assess the groundwater systems underlying the former MSA. Well locations at the former MSA and surrounding area are shown on Figure 4.

One upgradient groundwater monitoring well (MW-01) and two downgradient wells (MW-02 and MW-03) were installed at the former MSA during the RGA. Groundwater samples were collected from the three monitoring wells and from one onsite BWS well (BWS 2458-06) in March and August of 2002. The groundwater samples were analyzed for VOCs, polynuclear aromatic hydrocarbon (PAH), PCBs, dieldrin, TPH, metals, and major ions. Copper, lead, and zinc were the only COPCs detected in the former MSA groundwater samples, and none of the detected concentrations exceeded drinking water criteria (EPA Region 9 tap water PRGs [EPA Region 9 2002] or MCLs [EPA 2003]). Groundwater levels were monitored for a 6-month period. Water table elevations beneath the former MSA were found to be consistent with the gently sloping water table of the regional unconfined basal groundwater aquifer. The water table measurements, combined with the geochemical characteristics of the groundwater (i.e., major ion concentrations), indicate that groundwater beneath the former MSA is part of the regional groundwater system that occurs within fractured basalt bedrock inland of Pearl Harbor (Earth Tech 2003).

A human health screening preliminary risk evaluation (PRE) conducted during the RGA compared the former MSA groundwater data to EPA Region 9 tap water PRGs (EPA Region 9 2002). All detected COPC concentrations were below the tap water PRGs, and the screening PRE results indicated minimal potential risks associated with the residential exposure pathway. Comparison to the current tap water PRGs (EPA Region 9 2004) confirms the conclusion that all COPC concentrations detected in groundwater beneath the former MSA are below the tap water PRGs. Because no COPCs were detected at concentrations above drinking water criteria in groundwater beneath the former MSA, the RGA report concluded that chemicals released at the former MSA did not impact, and will not impact, groundwater (Earth Tech 2003). Therefore, NFA is recommended to address groundwater at the site. The former MSA monitoring wells were abandoned in 2005 and sealed to prevent chemicals potentially released near the well heads in the future from reaching the underlying groundwater.



LEGEND

- Excavation Areas with (Filled) Pit Locations
- Existing Building
- Site Boundary

N

0 300 feet
(APPROXIMATE)

Figure 5
Removal Action Excavation Areas
Former Manana Storage Area
Oahu, Hawaii

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2.2.5 CERCLA Enforcement Activities

No enforcement activities have been directed at the former MSA.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Navy developed a community involvement plan (CIP) to encourage and facilitate two-way communication between the Navy and local communities concerning environmental investigation and cleanup activities being conducted as part of the Navy's Installation Restoration Program. The CIP has the following objectives:

- Update previously published information for Navy installations.
- Reflect progress made by the Navy on the cleanup of contaminated sites.
- Update the public on changes to the proposed cleanup action for a few select sites.
- Describe the environmental conditions at new sites undergoing investigation.
- Reflect current interests and concerns of the communities.
- Establish a framework for open and meaningful dialogue between the Navy and the public throughout the environmental restoration process.

In an effort to involve the public in the decision making for the former MSA, and in accordance with the CIP, the Navy established a Restoration Advisory Board (RAB) composed of community representatives and Navy Installation Restoration Program personnel. The Navy also held public meetings, gave presentations, and issued fact sheets summarizing each step of the site investigation and cleanup activities, as follows:

- Public meetings were conducted and Fact Sheets were distributed for the Remedial Investigation, notifying the community of the investigation and providing a summary of results. (DON 1994 and 1995)
- A public meeting was conducted and a Fact Sheet was distributed for the Engineering Evaluation/Cost Analysis, providing information to the community about the proposed soil clean up. (DON 1996)
- A public meeting was conducted and a Fact Sheet was distributed for the RA, notifying the community of the planned soil clean up. (DON 1996)
- A public meeting was conducted and the Proposed Plan was distributed to notify the community of the proposed selection of as the final remedy for the former MSA.

In addition, the Navy established contacts for the public at Naval Facilities Engineering Command, Hawaii (NAVFAC Hawaii) and the Base.

The Proposed Plan was made available for public comment during a 30-day review period from 20 February through 22 March 2006. In addition, a RAB meeting was conducted on 8 March 2006 to present the Proposed Plan. The review period and RAB meeting provided the local community with opportunities to comment on the cleanup methods and strategy.

Project documents, including work plans, technical reports, fact sheets, and other materials relating to the former MSA activities, were placed in the information repository for the former MSA at the following locations:

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

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

Additional project information is located in the Administrative Record File at NAVFAC Pacific at Pearl Harbor. The address for the Administrative Record File is provided below:

Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Code EV4CO
Pearl Harbor, Hawaii 96860-3134
Telephone: (808) 473-1428

2.4 SCOPE AND ROLE OF FORMER MSA RESPONSE ACTION

Recommended Action. Based on the findings of previous investigations, successful completion of the RA, and the results of the RGA summarized in Section 2.2 of this ROD, no further action is necessary for the former MSA. Analysis of groundwater samples collected from monitoring wells at the former MSA indicates that COPCs detected in soil at the former MSA have not affected groundwater within the underlying basal aquifer. The monitoring wells have been abandoned and sealed to prevent future risk of contaminating the basal aquifer.

Overall Site Management Plan for PHNC. In the 1980s, the Navy began to implement preventive and mitigative procedures in conjunction with its base operations to prevent the releases of hazardous chemicals to the environment. However, chemical releases to the harbor, soil, and groundwater in some areas of the base resulted from previous military operations at PHNC. Concern over these historical releases led the Navy to identify 30 potential sources of hazardous waste in 1983. Based on the historical data, the PHNC was added to the National Priorities List on 14 October 1992 after completion of Hazard Ranking System screening, public solicitation of comments, and after all comments had been addressed. In March 1994, EPA, DOH, and the Navy signed a Federal Facility Agreement which identified procedures for addressing contamination at the PHNC (EPA Region 9, State of Hawaii, and DON 1994).

Scope and Role of former MSA Response Action in Overall PHNC Cleanup Strategy. To facilitate and manage the environmental investigation and cleanup activities at the PHNC, the *Site Management Plan* for PHNC (DON 2003) divided the installation into discrete geographic study areas, including the former MSA. Therefore, this ROD will allow the Navy to update the next Site Management Plan for the former MSA based on the actions listed below:

- This ROD recommends no further action for the former MSA based on the findings of previous investigations, successful completion of the RA, and results of the RGA.
- Past actions at the former MSA investigated and removed contamination in accordance with the overall *Site Management Plan* for PHNC.
- All other sites within the PHNC will be documented separately.

2.5 SITE CHARACTERISTICS

2.5.1 Site Description

The former MSA occupies a 109-acre parcel west of Waimano Home Road, approximately 0.4 miles northwest of the intersection with Kamehameha Highway. The southern boundary of the former MSA is approximately 1.2 miles northeast of the shoreline of the Middle Loch of Pearl Harbor. The former MSA is currently the site of 5 warehouses, 3 other buildings (including a Wal-Mart retail facility), a community center and park, and a maintenance facility for The Bus transit system. Throughout the history of the site, 32 Navy buildings and warehouses have been demolished.

2.5.2 Physical Setting

The former MSA site is located on the south flank of the Koolau Range. Interbedded alluvial and marine deposits form layers that overlay the Koolau basalt beneath the former MSA. The ground surface at the site slopes southwest toward Pearl Harbor, with elevations ranging from 77 to 132 feet.

2.5.3 Geology

The geology of the former MSA is based on the information obtained from surface soil and subsurface lithology observed in three borings, which were advanced for the installation of monitoring wells MW-01, MW-02, and MW-03 during the RGA field investigation (Earth Tech 2003), and the lithology from one deep monitoring well installed by the CCH (BWS 2458-06) in 2000.

The former MSA geological formation can be broadly divided into two geological units:

- Approximately 35–45 feet of upper soil layers
- Extrusive volcanic layers below

The soil formation at the former MSA is primarily the result of weathering of the bedrock, with gravel-dominated soils close to the bedrock and clay-dominated soils on the top layer. These soil layers, illustrated in Figure 6, gradually thicken from the high-elevation area around MW-01 toward the low-elevation area around MW-03. Based on observations during drilling, the gravel-dominated soil above the bedrock is likely a weathering zone along volcanic flow margins.

2.5.4 Hydrogeology

2.5.4.1 REGIONAL HYDROGEOLOGY

The basal aquifer that underlies the former MSA is part of the Pearl Harbor Aquifer, a currently used, irreplaceable source of drinking water, and the most productive aquifer in the state. Basal groundwater in the former MSA area originates as rainwater falling in higher drainage basins to the north and northeast and percolating vertically downward to the basal aquifer within the basalt bedrock. Fresh water of the basal aquifer floats on and displaces salt water, which saturates the highly permeable basalts at the base of the island of Oahu. The basal groundwater generally migrates seaward through zones of highly permeable, fractured basalt, and flows beneath relatively impermeable sedimentary confining layers (caprock) as it approaches Pearl Harbor. The Pearl Harbor Aquifer has been thoroughly investigated (Wentworth 1951; Mink 1980; Mink et al. 1988). Horizontal hydraulic conductivities of the fractured basalts of the Pearl Harbor Aquifer range from approximately 9×10^{-2} centimeters per second (cm/sec) to 7×10^{-1} cm/sec. The potentiometric surface of the basal aquifer slopes gently toward the shore of Pearl Harbor, and the regional hydraulic gradient averages approximately 0.3 meter per kilometer. The documented range of

hydraulic conductivities for the basal Pearl Harbor Aquifer is extremely high, ranging from approximately a few hundred to a few thousand feet per day (Bresler and Green 1982).

2.5.4.2 SITE HYDROGEOLOGY

Groundwater levels measured in the former MSA wells indicate that the water table slopes very gradually toward Pearl Harbor, consistent with high hydraulic conductivity and groundwater flow velocities. As mentioned above, the documented hydraulic conductivity for the basal Pearl Harbor Aquifer is extremely high, ranging from a few hundred to a few thousand feet per day (Bresler and Green 1982). The direction of groundwater movement at the former MSA also corresponds to the general regional groundwater direction (Figure 6). The former MSA monitoring wells MW-01, MW-02, and MW-03 and BWS well 2458-06 penetrate the Koolau basalt and demonstrate that water levels are consistent with those of regional unconfined basal groundwater.

According to Mink and Lau (1990), the former MSA site overlies an aquifer designated as the Waiawa System, part of the larger Pearl Harbor Aquifer Sector. Mink and Lau (1990) classify the region beneath the site as an unconfined basal aquifer system contained in horizontally extensive flank basalt lava flows of the Koolau Mountain Range. This aquifer is assigned a Status Code of 11111, indicating that the groundwater contained within is considered fresh water (i.e., with a chloride content below 250 milligrams per liter). This standard, defined by Mink and Lau (1990), is the allowable concentration limit for drinking water. The groundwater is also considered by Mink and Lau (1990) to represent a currently used, irreplaceable source of drinking-quality water that is highly vulnerable to contamination. The drinking water area defined by Mink and Lau (1990) is consistent with the federal groundwater classification. The EPA *Groundwater Protection Strategy* (EPA 1988) identifies a Class I groundwater body as an irreplaceable source of drinking water or ecologically vital. Because the aquifer underlying the MSA has been identified as an irreplaceable source of drinking-quality water and is currently used to supply drinking water, it fits the EPA criteria for classification as a Class I groundwater body.

2.6 CURRENT AND POTENTIAL FUTURE LAND AND GROUNDWATER USE

2.6.1.1 CURRENT AND FUTURE ONSITE AND SURROUNDING AREA LAND USE

Current land use surrounding the former MSA is predominantly residential with a commercial area to the southwest of the site. Future land use will likely include continued development for industrial/commercial purposes. In addition, the current offsite residential areas could be expanded into the former MSA.

2.6.1.2 CURRENT AND FUTURE GROUNDWATER USE

Groundwater beneath the former MSA is encountered at depths below approximately 100 feet bgs within the regional basal basalt aquifer, and is classified as a currently used, irreplaceable source of drinking-quality water, which is highly vulnerable to contamination (Mink and Lau 1987). Because the basal aquifer underlying the former MSA is currently used as a drinking water source (i.e., BWS wells are located within and adjacent to the former MSA site), current offsite and future onsite residents could potentially be exposed to chemicals in groundwater derived from the former MSA. However, as noted in Section 2.2.4.6, none of the chemical concentrations detected in the basal groundwater exceeded drinking water standards (EPA Region 9 tap water PRGs [EPA Region 9 2002] and MCLs [EPA 2003]).

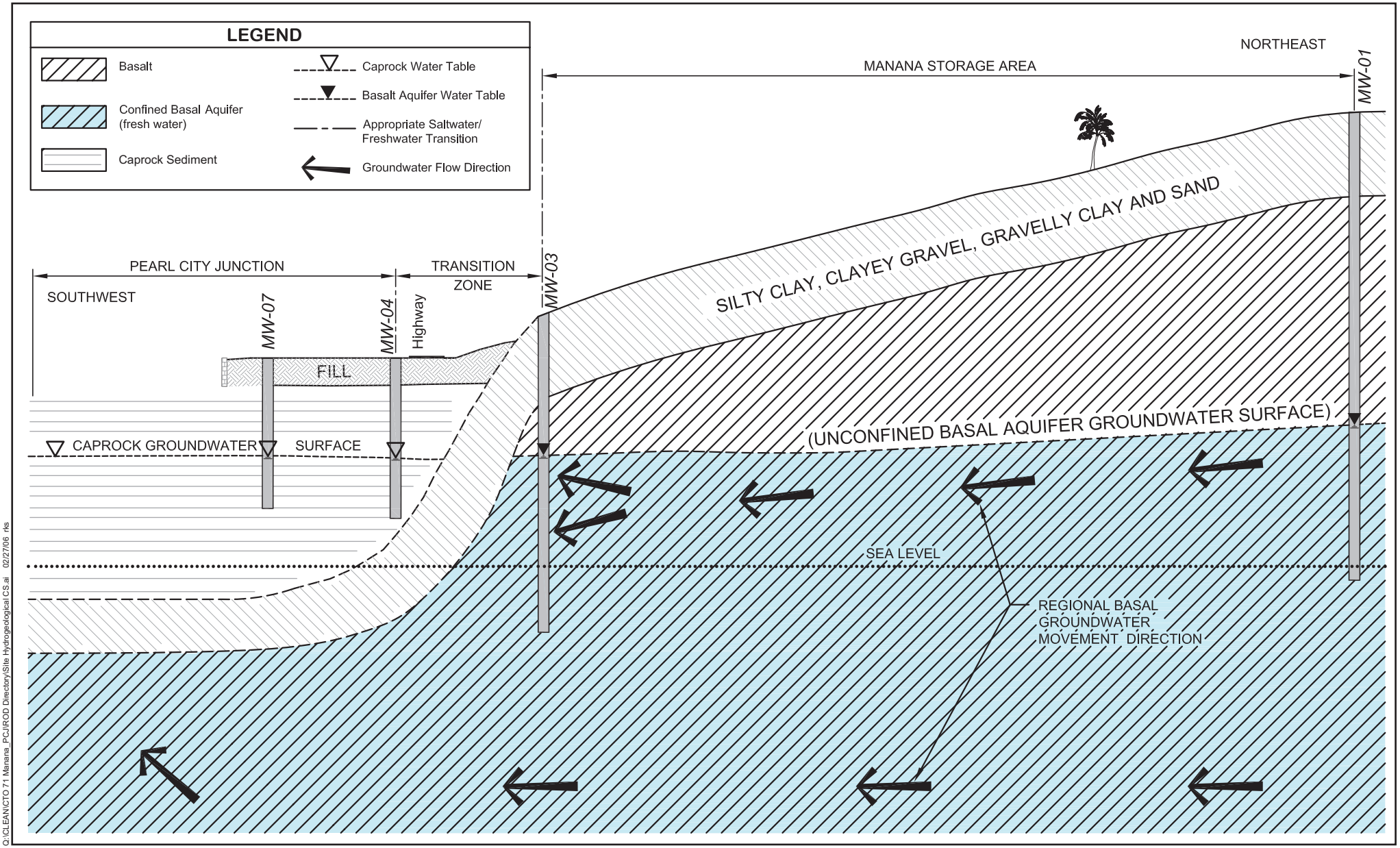

Figure 6
Site Hydrogeological Cross Section
Former Manana Storage Area
Oahu, Hawaii

2.7 SUMMARY OF SITE RISKS

2.7.1 Human Health Screening Preliminary Risk Evaluation

During the human health screening PRE (Earth Tech 2003), soil data were screened against the EPA Region 9 PRGs for residential soil (EPA Region 9 2002) to develop health-protective estimates of the risks associated with exposure to chemicals under the land use scenarios identified for the former MSA. The EPA Region 9 PRGs are human health risk-based criteria intended for direct comparison to detected concentrations of specific analytes. The soil investigation data (Ogden 1995) indicate that concentrations of all organic COPCs detected at the former MSA are below both the 2002 and 2004 EPA Region 9 PRGs for residential soil (EPA Region 9 2002 and 2004). Among the inorganic COPCs, only arsenic and lead were detected at concentrations above residential PRGs (EPA Region 9 2002 and 2004) and/or the upper bounds of the estimated background ranges. The RA verification sampling results indicate that soil containing arsenic or lead at concentrations that could threaten human health under the unrestricted (i.e., residential) use scenario have been removed from the site and disposed of at an approved offsite facility (OHM 1996).

The RGA was conducted to confirm that COPCs have not migrated into the groundwater at concentrations that could pose risks to human receptors. The maximum COPC concentrations detected in groundwater were used as exposure point concentrations (EPCs) for the PRE calculations. Maximum EPCs were established for all detected chemicals and screened against available EPA Region 9 (2002) tap water PRGs.

The groundwater samples were analyzed for VOCs, PAHs, TPH, PCBs (Aroclors), dieldrin, and a selected suite of metals. No organic chemicals were detected in groundwater samples from the former MSA wells. Copper, lead, and zinc were the only COPCs detected in the former MSA groundwater samples, and none of the detected concentrations exceeded drinking water criteria (EPA Region 9 tap water PRGs [EPA Region 9 2002 and EPA 2004] or MCLs [EPA 2003]).

Carcinogenic Risk. Cumulative cancer risk was not estimated for groundwater at the former MSA because no carcinogenic chemicals were detected.

Noncarcinogenic Hazard. The cumulative noncancer hazard associated with potential exposure to the maximum groundwater EPCs is expressed as a hazard index (HI) of 0.001 (for both total and dissolved metals), which is well below the threshold for unacceptable risk (HI of 1.0).

2.7.2 Risk Characterization

The investigation and risk assessment results presented above indicate that no unacceptable risks to human health, natural resources, or the environment have resulted from Navy activities at the former MSA. An ecological risk assessment was not necessary because no rare, endangered, or protected ecological receptors were found and no pathways for exposure of offsite ecological receptors were identified (Ogden 1995).

2.8 NO FURTHER ACTION REQUIRED

NFA has been selected as the final remedy for the former MSA based on the soil and groundwater investigation results and successful completion of the RA. As documented in the EE/CA report (Ogden 1996), the RA objectives were as follows:

1. Provide a remedy that offers long-term protection for human health and the environment through the remediation of arsenic-impacted soils at MO1 South, M03, M04, SB26, EA6,

and EA10 such that the average arsenic concentration in each of these areas is below or equal to 22 mg/kg;

2. Leave the site in a condition that is acceptable for possible future residential use;
3. Minimize impacts to current site operations and surrounding land uses during implementation; and
4. Facilitate achievement of the above RA objectives on an expedited schedule.

The overall goal of the RA was to allow unrestricted future use of the former MSA property.

No further action required because no unacceptable risks to human health were identified for the former MSA. The investigation and RA verification data indicate that no chemicals were detected at concentrations above risk-based levels of concern. As noted above, the investigation results indicate that groundwater beneath the former MSA has not been impacted and is not likely to be impacted by chemicals released during past Navy activities at the site.

2.8.1 Five-Year Review Requirements

CERCLA and the NCP provide the statutory and legal basis for conducting five-year reviews. Five-year reviews are not required for the former MSA because the remedy did not result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure.

2.9 DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes have been documented at the former MSA.

3. Responsiveness Summary

The 30-day comment period for the Proposed Plan (DON 2006) was held from 20 February through 22 March 2006, as announced in a Notice of Availability that was published in the *Honolulu Star-Bulletin* on 17 February 2006. A public meeting to discuss the Proposed Plan was held at the Pearl City Elementary School on 8 March 2006. This ROD has addressed all comments received during the 30-day comment period and in the public meeting (Appendix A).

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Appendix A
Responsiveness Summary

Project Title: Proposed Plan, Former Manana Storage Area
Pearl City, Oahu, Hawaii
Reviewer: Michael Miyasaka
Date: March 8, 2006

Comment No.	Section No.	Comment
1	General	Comment received during the 8 March 2006 Public Meeting: I'm Mike Miyasaka with the Department of Health. You mentioned that there's no further action for the site. Are there any land use controls for this on the site or what's the site cleared for?
Response: The RI findings and removal action results indicate that soil at the former MSA does not threaten human health or the environment under the residential land use scenario; therefore, no land use restrictions are required. The groundwater investigation results presented in the RI and RGA indicate that groundwater has not been impacted and meets drinking water standards. Therefore, no LUCs will be implemented.		