Draft Environmental Impact Statement

KEWALO BASIN REPAIRS PROJECT

Kaka‘ako Ahupua‘a, Kona District, Island of O‘ahu, Hawai‘i

HCDA

Prepared for Hawai‘i Community Development Authority
Prepared by Helber Hastert & Fee, Planners

October 2010

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This draft environmental impact statement and all ancillary documents were prepared under the signatory's direction or supervision, and the information submitted, to the best of the signatory's knowledge, fully addresses document content requirements as set forth in Chapter 343, Hawai‘i Revised Statutes, and Section 11-200-17, Hawai‘i Administrative Rules.

10/7/10

Anthony J. H. Ching
Executive Director
Hawai‘i Community Development Authority

Date

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ACRONYMS AND ABBREVIATIONS

§	Section
BLNR	Board of Land and Natural Resources
BMP	Best Management Practices
BWS	Board of Water Supply
CDD	Community Development District
CDUP	Conservation District Use Permit
CHl *a*	chlorophyll a
CIA	cultural impact assessment
CO	carbon monoxide
COMDTINST	Commandant Instruction
CPAC	Kaka'ako Makai Community Planning Advisory Council
CWA	Clean Water Act
CY	cubic yard(s)
CZM	Coastal Zone Management Program
db	decibel(s)
dBA	A-weighted decibels
DBEDT	Department of Business, Economic Development and Tourism
DEIS	Draft Environmental Impact Statement
DLNR	Department of Land and Natural Resources
DOH	Department of Health
DP	Development Plan
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
EPA	Environmental Protection Agency
ERL	effects range-low
ERM	effects range-median
ESA	Endangered Species Act
°F	Fahrenheit
FEA	Final Environmental Assessment
FIRM	Flood Insurance Rate Map
FL	Fill Land, mixed
FSEIS	Final Supplemental Environmental Impact Statement
ft	foot (feet)
ft^2	square foot (feet)
HAR	Hawai'i Administrative Rules
HCDA	Hawai'i Community Development Authority
HECO	Hawaiian Electric Company
HRS	Hawai'i Revised Statutes
hz	hertz
in	inch(es)
kg	kilogram
KKFC	Kewalo Keiki Fishing Conservancy
LR/FI	literature review/field inspection
L_{dn}	average day-night level (decibels)
LOS	level of service
LUC	Land Use Commission

LUO	Land Use Ordinance
m	meter(s)
MHHW	Mean Higher High Water
mg	milligram
MLLW	Mean Lower Low Water
msl	mean sea level
NH_4^+	ammonium nitrogen
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	ozone
OP	Office of Planning
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PIFSC	Pacific Island Fisheries Science Center
$PM_{2.5}$/ PM_{10}	particulate matter 2.5 microns/10 microns or less in diameter
PO_4^{3-}	orthophosphate phosphorus
PUCDP	Primary Urban Center Development Plan
RCRA	Resource Conservation and Recovery Act
rms	root mean square
SAL	soil action level
SDOT	State Department of Transportation
SEL	Sound Energy Level
SHPD	State Historic Preservation Division
Si	silica
SMA	Special Management Area
SO_2	sulfur dioxide
SOP	standard operating procedure(s)
SQG	sediment quality guidelines
SVOC	semi-volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TEPH	total extractable petroleum hydrocarbon
TMK	Tax Map Key
TN	total nitrogen
TP	total phosphorus
TPH	total petroleum hydrocarbon
TRPH	total recoverable petroleum hydrocarbons
UH	University of Hawaiʻi
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
UST	underground storage tank
VOC	volatile organic compound

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Chapter 1: INTRODUCTION AND SUMMARY

1.1 Introduction

This Draft Environmental Impact Statement (DEIS) has been prepared in accordance with the provisions of Hawai‘i Revised Statutes (HRS) Chapter 343 and Hawai‘i Administrative Rules (HAR) Title 11, Department of Health (DOH), Chapter 200 (EIS Rules). It discloses the environmental impacts of a proposal by the Hawai‘i Community Development Authority (HCDA) to undertake repairs and improvements at Kewalo Basin. See Figure 1 for project location.

Section 343-5, HRS, establishes nine “triggers” that require environmental review under the statute. The specific trigger for environmental review of the proposed project is the use of State lands and funds. The project area and associated harbor infrastructure are owned by the State of Hawai‘i, which will also fund the repairs and improvements. Based on the significance criteria set forth in Section 11-200-12 of the EIS Rules, the HCDA determined that the proposed action requires the preparation of an EIS. The project area is located within the Special Management Area (SMA), which is regulated by the State of Hawai‘i, Department of Business, Economic Development & Tourism (DBEDT), Office of Planning (OP). This EIS will also fulfill future SMA Use Permit application requirements of compliance with HRS Chapter 343.

1.2 Project Purpose and Need

Ownership of the Kewalo Basin assets was transferred from the State Department of Transportation to HCDA in early 2009. Based on the documented state of disrepair of many of the submerged assets at the facility, development of a repair and modernization program is essential to ensure that Kewalo Basin remains operational and commercially viable into the future.

The purpose of the proposed action is to facilitate the current and future uses of Kewalo Basin for commercial fishing, tour, charter, and pleasure craft operations, while maintaining a financially viable harbor as a commercial and community resource for the State.

The project is needed due to the deteriorated condition of some of the existing dock decks and other facilities within the harbor, the long-term need for recapitalization of the dock infrastructure, and the present lack of some dedicated utility systems that would improve human and environmental health and safety (e.g., fire suppression, wastewater pumpout, dedicated fuel dock).

The project would also allow for the incorporation of engineered solutions and improved technologies, where suitable, to address wind-generated waves and surge events that currently impact vessels in the harbor.

Kewalo Basin Repairs Project Environmental Impact Statement — **Figure 1**

Location Map

Hawai'i Community Development Authority

1.3 Project Summary

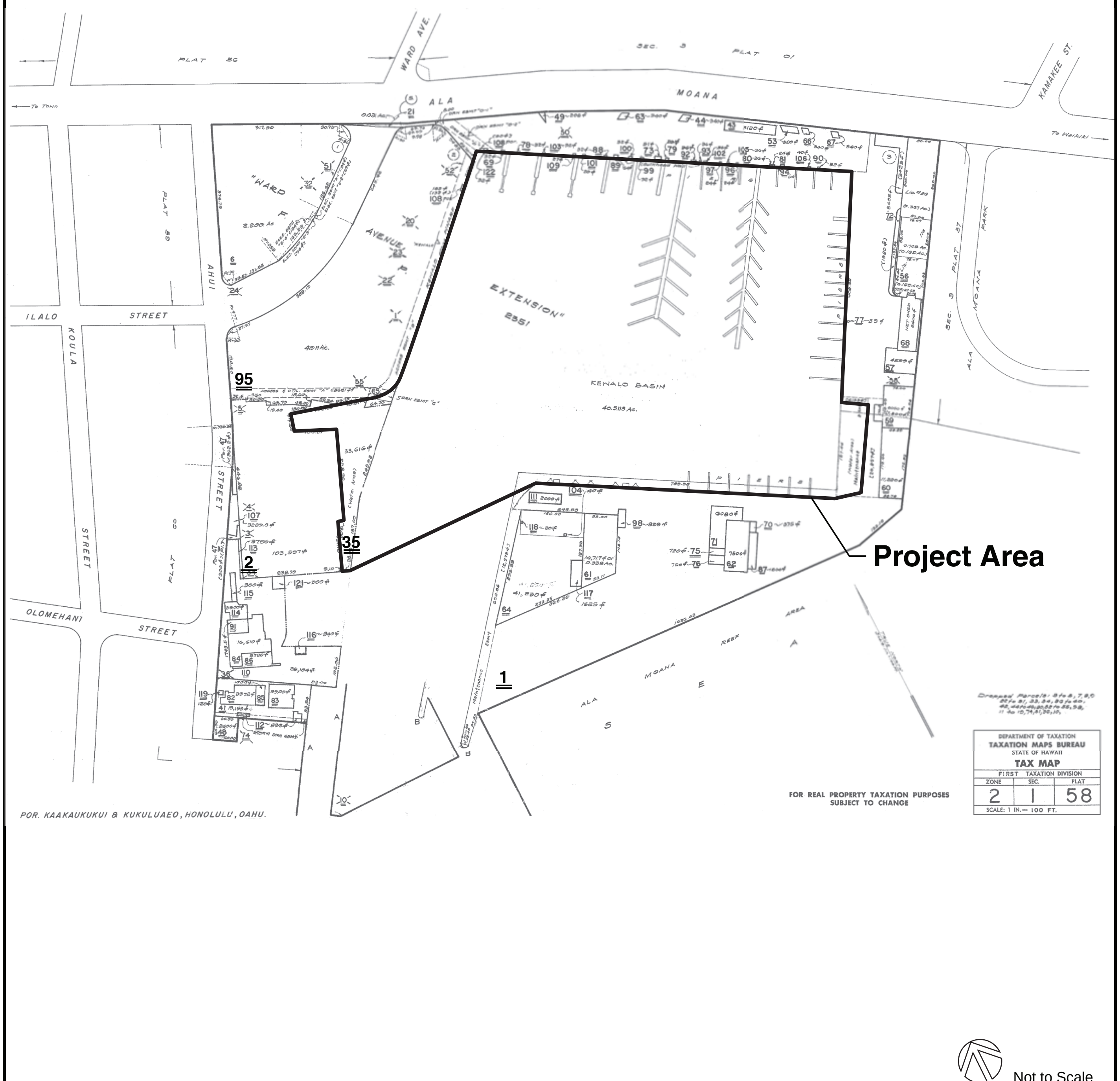
Project Name:	Kewalo Basin Repairs Project
Project Location:	Kaka'ako Ahupua'a, Kona District, Island of O'ahu, Hawai'i (Honolulu Judicial District)
Proposing Agency:	Hawai'i Community Development Authority 461 Cooke Street Honolulu, HI 96813 Phone: (808) 594-0300 Mr. Anthony Ching, Executive Director
EIS Preparer:	Helber Hastert & Fee, Planners 733 Bishop Street, Suite 2590 Honolulu, Hawai'i 96813 Phone: (808) 545-2055 Scott Ezer / Gail Renard
Accepting Authority:	Governor, State of Hawai'i
Proposed Action:	Replacement and potential expansion of wharf infrastructure at Kewalo Basin harbor, including fixed and/or floating docks, supporting piles, dockside utilities.
Tax Map Keys:	(1) 2-1-058: pors. 001, 002, 035, 095 (see Figure 2 for Tax Map)
Land Owner	State of Hawai'i, Hawai'i Community Development Authority
Existing Land Uses:	Boat harbor
State Land Use District:	Conservation (*pending State Land Use Commission boundary interpretation*)
Primary Urban Center Development Plan:	Harbor
Zoning:	Kaka'ako Community Development District (CDD), Makai Area Plan: • Submerged lands: No designation • Surrounding Fastlands: Waterfront Commercial
Special Management Area (SMA):	Within the SMA administered by State Office of Planning (due to location within Kaka'ako CDD)
Flood Insurance Rate Map Zone:	Fastlands adjacent to the harbor are within Special Flood Hazard Areas subject to inundation by the 1% annual chance flood. Fastlands to the east, west and south of the harbor are within Zone A (no base flood elevations

	determined). Fastlands to the north and east of the harbor are in Zone AE (base flood elevation of 4 feet determined) (See Figure 8).
Determination:	The Hawaiʻi Community Development Authority has determined that the proposed action requires the preparation of an Environmental Impact Statement, based on the significance criteria set forth in Chapter 200, Title 11, State of Hawaiʻi DOH.

The proposed action involves demolition and removal of all existing submerged structures, including Docks A, B, C and D ("Herringbone Dock"), the Front Row (Mauka Wharf) commercial vessel slips adjacent to Ala Moana Boulevard, and the Makai Wharf slips (see Chapter 2 for a detailed description and Figure 4 for a conceptual plan). Docks A, B, and C would be replaced with longer docks (Dock D would not be replaced). The Front Row slips along Ala Moana Boulevard would be reconstructed and a longitudinal berth provided adjacent to the Makai Wharf. At full buildout, the number of slips at Kewalo Basin would increase from the current 143 to 250. The proposed action also includes modernization of the potable water and electrical systems serving the slips, a new fire suppression system, new sewage pumpout, and a dedicated fueling dock. The proposed action would provide safety upgrades and modernized amenities for boaters, increase the availability of harbor facilities for the public, improve operational efficiencies within the basin, and better integrate the berthing and mooring facilities with shore-side utilities and infrastructure.

1.4 Project Location

The project area is located in the *ahupuaʻa* of Kakaʻako, Island of Oʻahu (Honolulu Judicial District), and consists of approximately 22 acres of submerged lands (see Figure 1). Figure 2 shows the project's Tax Map parcels. Oʻahu's primary visitor destination area of Waikīkī is located approximately 1.5 miles to the east and the downtown central business district of Honolulu is approximately one mile to the northwest. The commercial, retail, residential, and industrial area of Kakaʻako is located north and west of the project area. Primary vehicular access to the harbor is via Ala Moana Boulevard. Major landmarks in the vicinity are Ala Moana Beach Park to the east, Kewalo Basin Park to the south, and Ward Warehouse retail mall to the north.



Kewalo Basin Repairs Project Environmental Impact Statement **Figure 2**

Tax Map Plat 2-1-58

Hawai'i Community Development Authority

1.5 Required Permits and Approvals

Table 1 summarizes the permits and approvals required for the proposed development.

Table 1
Required Permits and Approvals

Permit/Approval	**Authority**
Department of the Army Permit (Section 10 Rivers and Harbors Act) – *required for structures in navigable waters of the U.S.*	U.S. Army Corps of Engineers (USACE)
Department of the Army Permit (Section 404 Clean Water Act) – *potentially required if discharge of dredged or fill material is conducted into waters of the U.S. (Note: Project does not propose any dredging or fill into U.S. waters.)*	USACE
National Pollutant Discharge Elimination System (NPDES) Permit	State of Hawai'i DOH
Section 401 Water Quality Certification – *required for proposed fuel dock*	DOH
Fuel tank installation and operations permits	DOH
Construction Noise Permit	DOH
Coastal Zone Management Consistency Certification	State of Hawai'i DBEDT OP
Special Management Area Use Permit	DBEDT OP
Conservation District Use Permit (*assumed required pending Land Use Commission interpretation*)	State Board of Land and Natural Resources

1.6 Significant Beneficial and Adverse Effects

Project implementation will result in potential impacts (discussed in Chapters 3, 4, and 7), both beneficial and adverse, to the natural and human environments. Measures to mitigate potentially significant adverse impacts will be included in project implementation. A summary of beneficial impacts, along with potentially significant adverse impacts and relevant proposed minimization and mitigation measures is presented below.

1.6.1 Beneficial Effects

- removal of existing damaged and deteriorated docks;
- improved safety for current and future harbor users;
- increased public access to the water;

- provision of modernized dock infrastructure that allows for the continuation of Kewalo Basin as an important commercial and recreational waterfront asset;
- provision of improved utility services for the harbor users;
- provision of a dedicated dock-side fire suppression system;
- provision of sewage pumpout system for harbor users who currently must discharge wastewater three miles from shore or at permitted sewage pumpouts at other harbor facilities;
- reduction in environmental risks associated with the lack of sewage pumpout;
- provision of a dedicated fuel dock that is subject to strict permitting controls;
- reduction in environmental risks associated with the current system of fuel delivery by providing better spill prevention control;
- accommodation of anticipated future demand for commercial and pleasure craft slips, as the island's population grows;
- short-term economic benefits from project design and construction;
- long-term public benefits of adequate and expanded berthing facilities; and
- long-term economic benefits from providing modernized facilities and dockside services that facilitate commercial operations utilizing the berths.

1.6.2 Potentially Significant Adverse Effects and Proposed Mitigation Measures

- Marine Sediments/Water Quality/Marine Resources. Temporary increases in sediment resuspension and increased turbidity within the water column due to dock demolition, pile removal, pre-drilling and pile-driving activities associated with construction. Potential elevations in concentrations of some hazardous or regulated compounds found in the marine sediments, which may result in adverse impacts to aquatic fauna within the harbor. However, the project area is well inshore of the coral reef communities dominated by native species; therefore, construction impacts would occur only to a presently highly disturbed benthic community dominated by alien species.
    - Proposed Mitigation. Best management practices (BMPs) during sediment disturbing activities will be in place to limit the resuspension of the sediments and contain the sediment in vicinity of these activities. Specific mitigation measures will be identified in consultation with relevant Federal and State regulatory agencies.
- Atmospheric Noise. Construction period noise levels are likely to exceed the daytime maximum permissible noise limits at the property line on an interim basis, primarily due to pile extraction and pile driving.
    - Proposed Mitigation. A permit from the State DOH will be obtained to allow the operation of the construction equipment, and all permit conditions will be complied with.
- Underwater Noise. Underwater noise generated during construction may, but are not likely to adversely affect protected marine species. Green sea turtles, whales,

dolphins and monk seals are unlikely to be in within the radius within which calculated sound energy levels created by pile driving in Kewalo Basin would reach levels that constitute harassment to protected species. Construction period underwater noise is not expected to adversely affect recreational diving in the vicinity.

  - Proposed Mitigation. Although it is unlikely that protected species would be found within the underwater construction noise radii of concern, several types of mitigation could further reduce the potential for adverse impacts due to construction period noise, including visual surveys of the affected area for species of concern. Specific mitigation measures and BMPs will be determined in consultation with the appropriate resource and regulatory agencies during the Department of the Army and SMA permitting processes.

- Marine Biological Resources. Although difficult to quantify, future increases in vessel traffic in and out of the harbor could present greater opportunities for collisions with protected species and increased vessel groundings on the reef on either side of the entrance channel that could adversely impact nearshore biota and habitats due to direct physical damage or indirectly due to petroleum spills or other contaminant releases. However, because of the expected mix of vessel types at project buildout, there is unlikely to be a significant increase in daily vessel traffic in and out of the harbor or the numbers of vessels operating in extreme weather conditions (when the risks of groundings increase). Therefore, the project is not expected to significantly increase the risk of vessel collisions with protected species or groundings, or their associated adverse impacts to nearshore biota and their habitats.
  - Proposed Mitigation. All vessels operating in State-controlled inland waters are required to follow "rules of the road," which are comprised of Federal and State statutory and regulatory rules governing vessel navigation. Standard spill response measures are encouraged and enforced by the Kewalo Basin harbor master.
- Harbor Operations and Navigation. There may be potential temporary disruptions to existing tenant operations during the construction period. Construction materials, construction equipment and work barges will be transported via water, and temporary increases in vessel traffic through the channel may be expected.
  - Proposed Mitigation. The construction phasing and methodology will be designed to minimize disruption to existing tenants during the construction period. For example, temporary berths may be provided to accommodate displaced vessels. Dock demolition will be alternated with new dock construction to minimize the decrease in available slips. Some permit-holders may have to be accommodated off-site for a portion or all of the construction period; however, all commercial operators will be accommodated at Kewalo Basin during project construction.

1.7 Alternatives Considered

In addition to the proposed action, several alternatives were considered and evaluated for their feasibility and their ability to meet project objectives:

- No Action Alternative (i.e., status quo)
- Patch Repair Existing Dock Structures
- In-Kind Replacement
- Alternative Layout
- Other Alternatives (e.g., postponing the project pending further study and alternative locations for the proposed project)

The **No Action Alternative** assumes that the harbor would continue to be utilized in its present arrangement and condition. Under this alternative, no capital expenditures would be made to carry out any long-term recapitalization of the aging and deteriorating structures within the harbor. Based on its current state of disrepair, this alternative is not considered a feasible approach since it does not safeguard the users of the harbor facilities (tenants and customers) or preserve the capital investment within the harbor. Therefore, the No Action alternative would not meet the project purpose and objectives and thus cannot be considered a "reasonable" alternative.

The **Patch Repair Existing Dock Structures** alternative would provide localized repairs to correct structural deficiencies in order to extend the life of the existing assets. Most of the Kewalo Basin docks have already undergone various forms of patch repairs during their service lives. Given the state of the existing docks, additional patch repairs are not likely to achieve the project objective of providing modernized berthing infrastructure to meet long-term needs. Therefore, it is not considered a reasonable alternative.

The **In-Kind Replacement** alternative would demolish the existing docks and replace them in their present layout. This would not achieve the project objectives of optimizing the capacity of the slips in the harbor and would not recognize the full potential project benefits. It would also not allow for incorporating new engineering solutions and technology to address the damaging effects of wind and storm-generated waves in the harbor and cannot be considered a "reasonable" alternative.

HCDA also considered a number of **alternate layouts** of the harbor's dock infrastructure, including the following.

Makai Wharf Finger Docks. In this alternate layout, two finger docks extending *mauka* into the harbor from the Makai Wharf would be constructed in lieu of Dock "C." The other elements of the proposed action would remain. Under this alternative, a total of 223 slips would be constructed, or 27 fewer slips than under the proposed action. This alternative would employ similar construction methodology to the proposed action, with similar potential environmental impacts. Because this alternative involves fewer slips and lineal feet of berthing, it is likely that the overall construction period would be shorter, resulting in reduced intensity of noise, marine water quality and biological impacts. Operational period traffic volumes generated from the harbor users would also be reduced from the proposed action, due to the smaller number of slips. This alternative is not carried through detailed environmental analysis because this EIS evaluates the potential impacts of the maximum development scenario (i.e., 250 slips as in the proposed action).

Large Excursion Vessel Berth. A second alternate layout for the harbor berthing and mooring infrastructure involved accommodation of a 250-foot excursion vessel in the harbor. In consideration of the navigability of such a large vessel, and due to limited space within the harbor, the only practical areas to moor her would be alongside the proposed maintenance dock situated adjacent to the current Honolulu Marine facility, or alongside the Fisherman's Wharf loading dock. The former location would change the intended use of the maintenance dock and limit the opportunities of the commercial and pleasure craft tenants to provide necessary maintenance to their vessels; the latter location would require dedicating the Fisherman's Wharf loading dock to a single large vessel in lieu of the proposed finger docks, resulting in a decrease of 52 slips for the full buildout of the project.

This alternative would also likely restrict the use of the channel to one-way vessel traffic while a vessel of this size is transiting, and access in or out of the harbor would be effectively halted while the vessel was performing turning maneuvers inside the basin, either on arrival or prior to departure. Its operational considerations notwithstanding, this alternative would likely result in impacts to upland support areas and traffic circulation that differ from those of the proposed action (extensive land support areas, different ingress/egress route for tour buses than privately-operated vehicles, potential structural and infrastructure improvements to Fisherman's Wharf). This alternate layout would not meet the project purpose and objectives described in Section 2.2 and thus, for purposes of the EIS analysis, it is not considered a "reasonable alternative." In the future, if a large excursion vessel is proposed for berthing in Kewalo Basin that requires improvements that are not covered in this EIS, a separate HRS Chapter 343 environmental assessment would be required.

Other Alternatives. Several other potential alternatives were evaluated in Chapter 6, including

- postponing the project pending further study
- alternative locations for the proposed project

For a variety of reasons explained in Chapter 6, these alternatives do not meet the purpose and objectives of the action.

1.8 Unresolved Issues

There are two issues that remain unresolved at the time of the preparation of this EIS, listed below. These issues are expected to be resolved prior to undertaking the proposed action.

- Identification of specific BMPs and mitigation measures for potential noise and water quality impacts in consultation with relevant Federal and State regulatory agencies.

- Land Use District boundary interpretation by the State Land Use Commission.

1.9 Compatibility with Land Use Plans and Policies

The proposed action is generally compatible with and supportive of relevant State and County land use policies, plans and controls, as described in Chapter 5.

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Chapter 2: PROJECT DESCRIPTION

2.1 Background Information

2.1.1 Historic Perspective

Kewalo Basin is a commercial and recreational boat harbor first developed in the 1920s with construction of the Kewalo Basin Wharf, which presently fronts the former Fisherman's Wharf restaurant site. This was followed by construction of the *mauka* bulkhead and the Waikīkī bulkhead. The current harbor area of approximately 22 acres has been maintained since the harbor was dredged and expanded during World War II, and the Makai revetment constructed in 1955. The Makai revetment enclosed the harbor and provides sheltering from Kona storms. The harbor is considered a medium-draft facility with a minimum design water depth of 20 feet.

The HCDA regulates planning and zoning for the 600-acre Kakaʻako Community Development District ("Kakaʻako CDD"), in which Kewalo Basin is located. Kewalo Basin is a mixed-use harbor used by commercial (fishing and excursion) and pleasure craft. It has historically been an instrumental part of Honolulu's waterfront, serving as a small boat commercial harbor for intra-state commercial activities and supplementing the inter-state commerce of larger harbors administered by the State of Hawaiʻi Department of Transportation (SDOT) Harbors Division. Previously controlled by the SDOT Harbors Division, Kewalo Basin and the surrounding State-owned fastlands were transferred to HCDA by Act 86 in 1990, and jurisdiction of the harbor was transferred on March 1, 2009. The harbor's submerged lands are now managed by Almar Management under contract to HCDA.

2.1.2 Existing Use

Kewalo Basin harbor consists of 143 boat slips provided on four docks (A, B, C, and D ("Herringbone Dock")), and three wharves (Mauka Wharf or "Front Row," Makai Wharf, and Fisherman's Wharf) (see Figure 3). The existing slip lengths and number of slips are shown in Table 2.

Kewalo Basin Repairs Project Environmental Impact Statement

Figure 3

Project Area and Vicinity

Hawai'i Community Development Authority

Table 2
Current Kewalo Basin Slips

Slip Length (linear feet)	No. of Slips
30	1
40	13
44	1
50	39
54	2
60	14
64	1
66	10
68	2
70	26
80	18
90	5
100	11
Total	143

As of March 2010, harbor occupancy was about 130 vessels, or almost 90% of the current capacity. Prior to Almar Management assuming management of the harbor in 2009, harbor occupancy was less than 60 vessels (~40%).

Historically, the harbor has catered predominantly to commercial operations, and today, the harbor's tenants include a mix of commercial fishing, charter tour, pleasure craft, and research vessel operators. The commercial fishing fleet includes both holders of annual permits as well as transient vessels that hold permits of up to 90 days.

2.1.3 Surrounding Land and Water Uses

Land uses immediately surrounding the harbor include the Kewalo Basin Park, a National Oceanic and Atmospheric Administration (NOAA) Pacific Island Fisheries Science Center (PIFSC) facility, and a net drying shed on the peninsula enclosing the harbor to the south; the former Fisherman's Wharf restaurant, Honolulu Marine, Inc. shipyard, Kewalo Keiki Fishing Conservancy (KKFC), John Dominis Restaurant, and the University of Hawaiʻi (UH) Kewalo Marine Laboratory on the west (see Figure 3 for locations).

The 5-acre Kewalo Basin Park was developed by HCDA and opened in September 1990. It is located on the peninsula that forms the harbor's southern boundary. Vehicular access is via Ala Moana Boulevard and includes parking for 110 cars. It is a popular site for surfing and fishing and its pedestrian promenade provides access to the waterfront.

NOAA PIFSC administers scientific research and monitoring programs that support conservation and management of marine resources. At Kewalo Basin, NOAA PIFSC maintains a shoreside research facility that includes offices, laboratories, a machine shop and storage for research equipment. The NOAA PIFSC compound also includes portable buildings for its Coral Reef Ecosystem Division, and saltwater wells for holding marine life such as pelagic fish, Hawaiian monk seals, and sea turtles. This use is scheduled to be consolidated with other NOAA facilities at its planned Ford Island Pacific Regional Center in 2013.

The Kewalo Basin harbor master shares the building adjacent to the Makai Wharf with NOAA PIFSC. The harbor master offices are accessed from the *mauka* side of the building.

An 8,400-square foot open-sided pavilion ("net shed") is located south of the NOAA facility, adjacent to the Kewalo Basin Park. This facility was originally constructed as a place for commercial skipjack tuna ("aku") fishermen to dry their fishing nets. Due to changes in the fishing fleet at Kewalo Basin, as well as changes in equipment (nylon nets are now used), this facility is no longer needed as a net drying shed. Currently, it is used for storage of the park's landscaping equipment and by a public charter school ("Hālau Kū Māna") as a learning laboratory. The main campus of Hālau Kū Māna is in Makiki Valley. It has leased space in the net shed from HCDA since 2006 under a lease for an ancillary school facility. The school constructed and maintains a Native Hawaiian garden in a small area adjacent to the net shed as a condition of its lease to provide educational opportunities for their students and educational value for the patrons of the park.

In January 2010, HCDA selected Advanced Restaurant Management (under "Kewalo Wharf, LLC") to lease the 7,400-square foot building that formerly housed the Fisherman's Wharf Restaurant, an iconic Honolulu nautical-themed restaurant. The lease conditions require the new restaurant operator to feature a menu and décor acknowledging the unique history of Kewalo Basin.

Honolulu Marine, Inc. operates on the west side of the harbor, and performs repair and maintenance of fishing boats, barges, tugs, and U.S. Navy boats. Honolulu Marine is expected to relocate from its current location to a site at Honolulu Harbor near Ke‘ehi Lagoon in 2013.

The KKFC is a non-profit organization that uses the cove area and adjacent lands seaward of Honolulu Marine, Inc.'s facilities to teach children fishing skills, conservation principles, and Hawaiian cultural traditions for the preservation of ocean resources.

The John Dominis restaurant is a 30+ year old waterfront seafood restaurant that is scheduled to close in the near term. Its new owner, Ocean Investments LLC, plans to demolish the existing structure and build a complex with a restaurant and meeting facilities.

The UH Kewalo Marine Laboratory is located at the seaward-most point on the west side of the harbor entrance channel. This facility includes a three-story, 17,400-square foot laboratory building used by full-time research teams and visiting investigators.

2.2 Project Purpose and Need

2.2.1 Purpose of Project

Ownership of the Kewalo Basin assets was transferred from SDOT to HCDA in early 2009. Based on the documented state of disrepair of many of the submerged assets at the facility, development of a repair and modernization program is essential to ensure that Kewalo Basin remains operational and commercially viable into the future.

The purpose of the proposed action is to facilitate the current and future uses of Kewalo Basin for commercial fishing, tour, charter, and pleasure craft operations, while maintaining a financially viable harbor as a commercial and community resource for the State.

2.2.2 Need for Project

The various docks in Kewalo Basin were constructed incrementally over many decades, and most of the structures have been repaired, renovated and/or demolished and replaced since their original construction. As a result, the existing structures range in age from approximately 12 to 15 years (catwalk docks on the *'ewa* side of the Mauka Wharf reconstructed in the late 1990's) to nearly 50 years (the finger docks on the Diamond Head side of the Mauka Wharf). Based on the results of a 2007 condition study commissioned by HCDA of selected structures within the harbor, there appears to be extensive deterioration of the superstructure, evidenced primarily by corrosion damage on the undersides of the dock decks. Consequently, there is a short-term need to address the conditions of finger docks B, C, and D, and provide modernized dock-side utility infrastructure. There is also a longer term need for the eventual recapitalization of the dock infrastructure for the entire harbor.

In addition, there is no sewage pumpout system available for smaller commercial and recreational vessels that do not have their own onboard pumps. These vessels must either discharge their wastewater three miles offshore or at permitted sewage pumpouts at other harbor facilities. These procedures can pose an inconvenience for the vessel operators, and if any lapses in compliance occur, it would affect water quality in the harbor and in nearshore waters.

There is also no dedicated firefighting water system or dedicated fueling system currently available at the existing docks. The proposed action includes provision of a new dedicated fire suppression system, wastewater pumpout unit, and fuel dock to serve existing and future harbor users.

Kewalo Basin is subject to wind-generated waves and surge within the harbor, and mooring lines that secure vessels to the fixed docks can become overstressed and damaged over time as the vessels rise and fall with the wave energy. The vessels themselves may also be damaged by impact to the docks during these conditions. The proposed action considers engineered solutions and improved technologies (e.g., floating docks, where suitable) that could reduce the severity of these conditions inside the harbor.[1]

In 2008, HCDA also conducted meetings with existing harbor stakeholders prior to the transfer of Kewalo Basin management from SDOT to discuss and obtain feedback on the needs of harbor users, needed repairs and maintenance, and the proposed administrative rules. The stakeholder group included existing Kewalo Basin tour and charter fishing operators, commercial fishermen, and other interested parties. Participant input indicated that the extension of Dock A, replacement of Docks B and C, demolition of Dock D, and related infrastructure/security work were the most important harbor repair projects to undertake (HCDA June 18, 2008 and October 8, 2008). Meetings with Kewalo Basin stakeholders have continued through the project planning and design process.

Due to the deteriorated condition of the dock decks and other facilities within the harbor, HCDA proposes to repair or replace the existing harbor infrastructure. In addition to addressing the condition of the existing infrastructure, HCDA recognizes that demand for slips will increase as O‘ahu’s population grows over the next 20-30 years.

2.2.3 Project Objectives

The proposed action is intended to meet the following objectives:

- provide modernized berthing and mooring infrastructure and supporting dock-side utilities in Kewalo Basin harbor to address present deficiencies and meet long-term needs;
- accommodate existing harbor users, including commercial fishing and excursion enterprises; and
- optimize berthing and mooring capacity of harbor.

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[1] The offshore storm waves that enter Kewalo Basin comprise both a long period swell and short period waves within the harbor. Short period incident wave heights may be reduced by installing reflective baffle structures on the pile-supported fixed docks near the head of the channel (e.g., proposed fuel dock at Makai Wharf and fixed dock on Fisherman’s Wharf). These baffles would provide a level of localized wave attenuation in the critical areas of the harbor near the channel, but would provide no discernable improvement to the longer period swells.

The use of floating docks in some areas of the harbor, where determined by engineering analysis to be suitable, would minimize the occurrences of mooring line damage and vessel-to-dock impact damage under the influence of longer period swells by allowing both the dock and the vessel to rise and fall with the swell. The motion of the floating docks and the vessels moored to them also provides a natural attenuation to shorter period waves, which may reduce the effects of locally generated waves in the harbor caused by passing vessel wakes.

2.3 Project Description

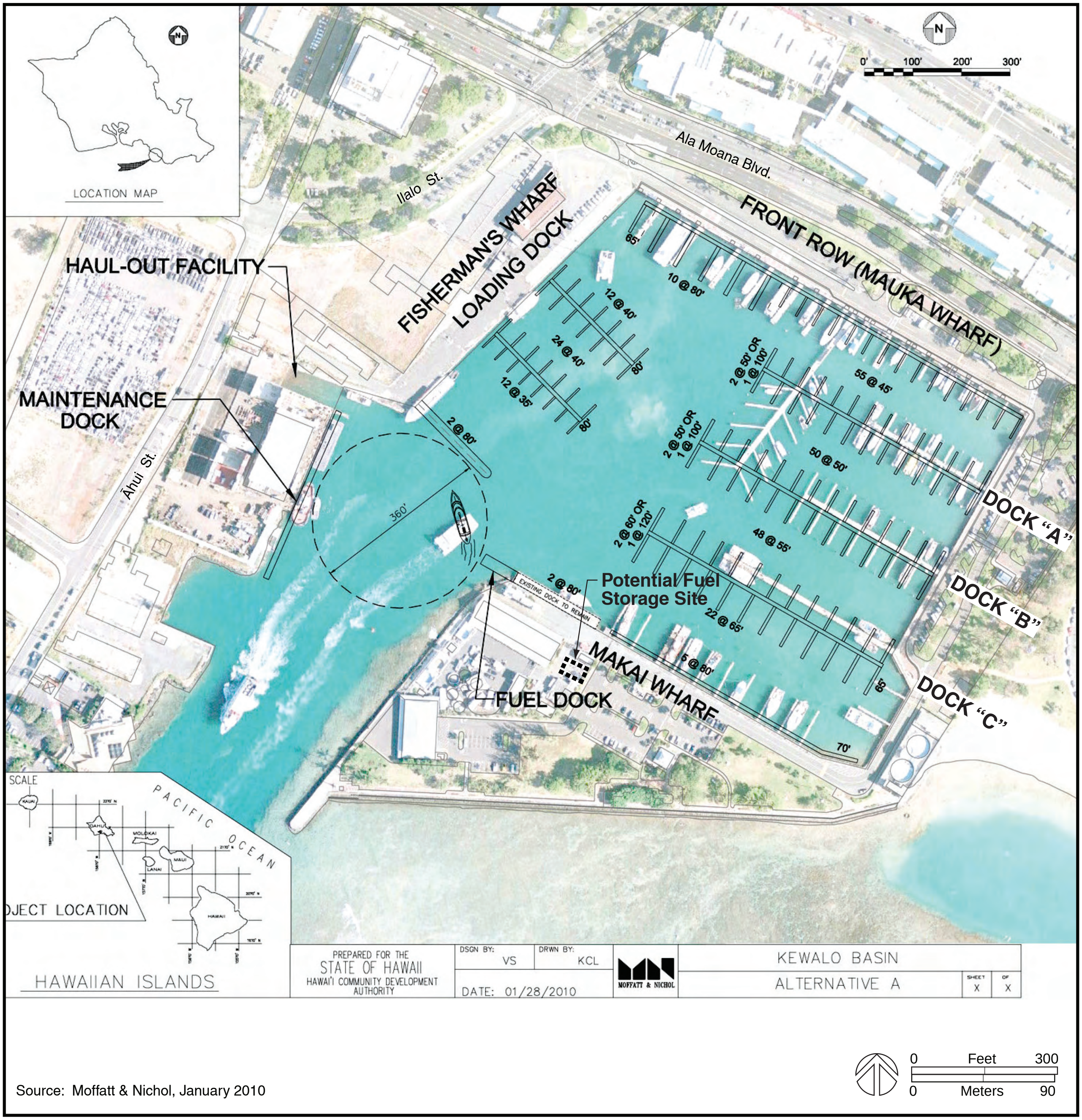
In developing the scope of the proposed action, HCDA considered a number of alternatives, with input from various stakeholders comprising the Kewalo Basin Stakeholder Advisory Group (e.g., longliner, commercial fishermen, tour/excursion, recreational boaters, SDOT, Department of Land and Natural Resources, Kaka'ako Makai Community Planning Advisory Council, Friends of Kewalo Basin Park, land tenants, etc.). A discussion of alternatives considered, including alternatives that do not meet the objectives of the proposed action, is provided in Chapter 6.0.

2.3.1 General

The proposed action involves demolition and removal of all existing submerged structures, including Docks A, B, C and D ("Herringbone Dock"), the Front Row (Mauka Wharf) commercial vessel slips adjacent to Ala Moana Boulevard, and the Makai Wharf slips. The full build out redevelopment concept for Kewalo Basin increases moorage densities within the harbor, provides modernized amenities to boaters, improves operational efficiencies within the basin, and better integrates the berthing and mooring facilities with shore-side utilities and infrastructure.

The proposed project includes the following key features (see Conceptual Buildout Plan in Figure 4):

- 250 slips ranging in dedicated lengths from 35 feet (ft) to 120 ft, with a total length of moorage of approximately 13,100 ft. The structures represent an aerial coverage of 75,800 square feet (ft^2), or about 7.7% of the harbor footprint.
- Replacement of Docks A, B and C with longer docks to compensate for the removal of the Herringbone Dock (Dock D);
- Reconstruction of the Front Row (Mauka Wharf) slips with reconfigured lengths and widths to optimize their usability and the capacity of the harbor;
- Construction of a longitudinal berth adjacent to the Makai Wharf;
- Construction of two new finger docks for small- to medium-sized commercial vessels extending from the Fisherman's Wharf loading dock;
- Construction of a single jetty dock at the *makai* end of the Fisherman's Wharf loading dock;
- Construction of a fueling dock, extending '*ewa* of the existing *makai* loading dock, and installation of associated fuel tank (possibly underground; to be determined by applicable regulations);
- Construction of a dedicated marine maintenance dock adjacent to the current Honolulu Marine Inc. shipyard facility;
- Modernization of the water and electric utilities that service the new slips;



Source: Moffatt & Nichol, January 2010

Kewalo Basin Repairs Project Environmental Impact Statement **Figure 4**

Conceptual Buildout Plan

Hawai'i Community Development Authority

- Provide septic handling systems at the improved facility for the disposal of onboard septic waste directly into the municipal sanitary system. This may include a dock-based, mechanical pump-out station; and
- Provide water supply and fire-fighting capabilities at the improved facility.

The new docks will likely be a combination of fixed and floating, which will be determined in the upcoming design phases. Both fixed and floating docks will require the demolition of existing supporting piles and the installation of new piles. The total number of new piles required at full buildout will be determined by the type of docks (fixed or floating) constructed. Depending on the type of dock, the number of new piles required to support the projected 75,800 ft^2 of total dock structure area will range from 300 (if all are floating) to 500 piles (if all are fixed).

2.3.2 Utilities

Potable water service consistent with the current level of service will be provided at the replaced and new docks. Existing connections to the laterals at the bulkhead walls will be used where feasible to minimize onshore modifications. Existing onshore water distribution lines and laterals may need to be extended to provide service to the proposed maintenance dock adjacent to Honolulu Marine, Inc. if water lines are not available in the vicinity of the new docks. Potable water hose bibbs will be housed at dock boxes or pedestals on the docks.

Fire suppression service will be provided at the new and/or replacement docks. Fire extinguishers will also be provided at dock-side. The fire suppression system will tie in to the onshore water system.

Presently, Kewalo Basin provides a sewage collection system at the Makai Wharf for larger commercial fishing vessels that are equipped with onboard sewage pumps. These vessels pump the sewage through the onshore system to an existing sewage lift station near the harbor master’s building adjacent to the Makai Wharf where it is conveyed into the municipal wastewater system for treatment and disposal. However, the facility does not currently offer sewage pumpout services for smaller commercial vessels and recreational vessels without onboard pumps. These vessels are required to discharge onboard wastewater according to U.S. Coast Guard regulations (i.e., three miles offshore or at permitted sewage pumpouts at other harbor facilities). The proposed action includes a new pumpout unit at the Makai Wharf to service smaller vessels without onboard sewage pumps. The new pumpout unit will tie in to the existing lift station. Future system upgrades may provide for in-slip sewage pumpouts.

2.3.3 Fuel Dock

A dedicated fueling service is not currently available at Kewalo Basin. Present fueling practices involve truck deliveries to the harbor. The fuel trucks generally have a 100-gallon delivery capacity, while some of the commercial vessels have up to 130-gallon fuel tanks onboard (parasail operators). The proposed action includes a dedicated fueling facility to be located on a dock extension at the west end of the Makai Wharf. Both diesel and gasoline are being proposed to be supplied at the fuel dock. The current practice of utilizing fuel trucks involves greater environmental risks than a dedicated fueling station as they are not subject to the same level of permit process or controls. In the current practice, the fuel trucks park in vehicle access or loading areas and extend fuel lines over docks to the receiving vessel. The fueling dock would likely be constructed in a later, yet unfunded construction phase (i.e., 5-10 years after initial phase).

Fuel storage tanks will be installed on fill land in the area adjacent to the fuel dock (see Figure 4 for potential location near the harbor master's office). A conservative estimate of tank capacity is 30,000 gallons (e.g., 20,000 gallons of gasoline for commercial operators and 10,000 gallons of gasoline for pleasure craft). These tanks may be located underground for protection from storms and vandalism, and to reduce visual impacts, according to applicable code. A 15,000- to 20,000-gallon tank would be approximately 10 ft deep by 50 ft long. If constructed, the ultimate location of the fuel storage tanks will be determined by proximity to the fuel dock, tanker truck route, tanker truck parking for off-loading fuel, and location of existing underground utilities.

Although detailed fuel tank specifications will be determined closer to its actual construction, there are many standard fail-safes and redundancies used in fuel storage systems to reduce the risk of leaks and spills. For example, these may include double walled construction of tanks and pipes, monitoring of fluids in the interstitial space between the tank or pipe walls, tank inspection ports, automatic and manual flow cut off at the tanks as well as at the pumphead, tank overflow protection, use of corrosion resistant materials, periodic inspections, meter reconciliation, operational practices (e.g., secured access, no nighttime operations, assisted pumping). Automatic leak detectors and alarms are also relatively standard features in fuel storage systems. The fueling dock will require a Clean Water Act (CWA) Section 401 Water Quality Certification from the State of Hawai'i DOH; specific best management practices (BMPs) and standard operating procedures (SOPs) will be identified as a part of the permit application process and will likely become conditions to the permit approval. The State DOH also oversees underground storage tank installation and operations permits.

2.4 Project Phasing and Timing

The proposed action will be implemented in phases over several years according to the availability of project funding; however, this HRS 343 document addresses the environmental effects of the full buildout project. The HCDA Board of Directors authorized the expenditure of $4.9 million for major harbor improvements in 2009, which will be used to construct the initial phase of the project. By mid- to late-2011, the design of the first phase will be completed and the required development entitlements and permits obtained, after which a construction contract may be awarded. Construction of the initial phase could be completed within an eight- to twelve-month period (i.e., by the end of 2012).

The initial phase of the project represents approximately one-third of the full project scope, and will likely involve demolition of approximately 58 slips at Docks B (28 slips), C (8 slips), and D (22 slips), and construction of new, longer Docks B and C as fixed or floating docks. The exact configuration of the replacement docks will be determined by HCDA in consultation with the Kewalo Basin Stakeholder Advisory Group; however, there would be an estimated 79 slips constructed in the replacement Docks B and C—for a net increase of 21 slips in Phase 1 (Dock B: 50 slips; Dock C: 24 finger slips on the *mauka* side and 5 alongside slips on the *makai* side). Dock A would likely remain until it is replaced in a later construction phase, as its condition is still adequate.

Full buildout of the project is dependent on the future availability of funding. Assuming a similar level of expenditure is authorized every 3-4 years, the project could be completed within 10 years. However, for purposes of the EIS analysis, a more conservative buildout period of 15 years is used.

2.5 Construction Methodology

2.5.1 General/Overview

The structural arrangement of the new docks may be either floating or fixed docks, and the full build out alternative will likely include a combination of the two, to accommodate the varied sea state and vessel requirements within the harbor. Dock structures located in areas of the harbor that are directly affected by waves entering through the entrance channel may require the greater strength and rigidity offered by fixed docks than those in more sheltered areas of the harbor, In addition, docks that support larger vessels with high freeboards and loading decks may require fixed docks. The structural arrangement will be developed to meet the performance requirements established during the project design process.

As described previously, the first phase of the project involves demolition of three finger docks (B, C, and D) and construction of at least the same number of replacement slips (up to about 21 additional slips). The construction phases will generally include the following activities:

- Demolition and disposal of existing concrete infrastructure, including extraction of piles from the seabed.
- Creation of an upland storage and staging area (anticipated to be on the ‘*ewa* side of the harbor).

- Off-site fabrication of precast float modules for floating docks and precast deck panels for fixed docks.
- For fixed docks, construction will involve pile driving for installation of the support piles, forming and pouring cast-in-place reinforced concrete pile caps, installation of the precast deck panels, and placement of a topping concrete deck pour.
- For floating docks, construction will involve assembly of float modules and pile driving to install the guide piles that secure the floats in place.
- Installation of topside appurtenances (fenders, cleats, dock boxes, utilities, etc.).
- Installation and/or extension of existing landside utility services to accommodate the revised layout of the new docks.
- Installation of landside utility connections and connection to shoreside services.

In general, demolition of each dock will take approximately one month. Installation of the new docks will require approximately one to two months, depending on whether the structure is floating or fixed. The estimated construction durations will be based on the construction contractor's ability to work with minimal interruptions from existing harbor operations.

The construction sequence will alternate between a demolition and an installation, and the sequencing will be developed to minimize tenant disruptions to the greatest extent practical. The total construction duration for Phase 1 (expected to include demolition of Docks B, C, and D (Herringbone), and the installation of improved Docks B and C) will be approximately 8 to 12 months at intermittent periods to suit the sequence of demolition and construction. The work is expected to occur during daylight hours to minimize potential noise and light pollution impacts associated with nighttime work.

2.5.2 Demolition

Demolition of the existing docks would be conducted from the waterside by a barge-mounted crane (which would serve as both a demolition rig and a pile driver) and lay-by barge to receive demolition debris. The topside decks would be cut and lifted onto the barge, the concrete pile caps will likely be demolished in place using a hydraulic breaker, and the piles extracted with the aid of a vibratory hammer. Demolition debris would not be permitted to enter the harbor.

In the full buildout plan, a total of 400 existing piles would eventually be removed. Approximately 60% of the existing piles are 16.5-inch (in) octagonal pre-stressed concrete, 10% are 20-in octagonal pre-stressed concrete, and the remaining 30% are 12- to 14-in steel H-piles.

Demolition debris would be hauled from the site using dump trucks and disposed of in an appropriate landfill. The debris would consist of an estimated 1,000 cubic yards (CY) of concrete, 200 CY miscellaneous debris, and approximately 400 piles (typically 50 ft long).

The steel piles can be recycled and the concrete piles can be crushed and used as aggregate in new concrete to reduce solid waste generation.

2.5.3 Dock Construction

The new docks will consist of a mix of fixed and floating docks, depending on their utility, vessel requirements and the wave climate within the basin. Based on initial analyses and review of the conditions within the harbor, it is expected that the new docks on the *'ewa* side and the predominantly commercial slips along the Front Row will be primarily fixed docks, due to the exposure to incoming storm waves from the entrance channel and larger vessel requirements. The docks extending from the Diamond Head side of the basin and the Makai Wharf may include floating docks, provided that they meet performance specifications. This will be determined during the bidding periods of the project.

Off-Site Fabrication. Prefabrication of a number of project elements will streamline the construction process. Elements that can be prefabricated off-site include the new floats, dock deck panels, and guide piles. These items are likely to be constructed offsite in a contractor's yard/facility, and then transported to Kewalo Basin in modular form by either towing over water or trucking over land.

Pile Installation. Pile driving within the harbor will be conducted using a barge-mounted diesel or hydraulic impact hammer (use of a vibratory hammer is unlikely). Pile installations may require pre-drilling with a barge-mounted auger drill. Based on the limited space in the harbor, it is expected that no more than one barge-mounted pile driver would be used at any one time (i.e., demolition and pile driving would not occur simultaneously, and only one pile driver would be operated at a time). At full buildout, the number of piles will range between approximately 300 and 500 piles, depending on the structural arrangement of the new docks (fixed docks generally require a greater number of piles, possibly driven to a greater depth to reach capacity).

The new piles are assumed to be in the same range of sizes and materials as used in the most recent piling installations at the Front Row catwalks (i.e., 16.5-in or 20-in octagonal pre-stressed concrete piles). The average pile driving rate would be one to two piles per day. Depending on the subsurface conditions, the rate may be slower if extensive pre-drilling and deeper penetrations are necessary. Because the project will be constructed in phases, several years will separate each concentrated period of dock demolition and pile installation (i.e., Phase 1 construction will involve a fraction to the total piles required for project buildout).

Fixed Dock Construction. For fixed docks, typical construction involves pile driving for installation of the support piles, forming and pouring cast-in-place reinforced concrete pile caps, installation of the precast deck panels, and placement of a topping concrete deck pour. Based on the current topography of the adjacent fastlands, the dock elevations will be set to match the bulkhead elevations, which provide approximately 2 ft of freeboard above high tide levels. The precast deck panels may be between 30 and 40 ft long, which would determine the spacing of the piles and pile caps.

The shore ends of fixed docks will either be terminated at the bulkhead, which would require a transition plate to bridge the gap between the structures, or, alternatively, be rigidly connected to the bulkhead, requiring additional localized demolition of the bulkhead cap. Both systems are considered feasible for the new docks at Kewalo Basin. However, fixed docks proposed along the current Honolulu Marine Inc. area will be connected to the bulkheads using a transition plate rather than a rigid connection. This will be done in order to minimize alteration of the existing bulkheads, which are considered historic properties (see Section 4.8 for discussion of historic resources). See Figure 5 for schematic cross-sections of a typical fixed dock connection to the adjacent bulkhead (Cross-Section B).

Topside dock appurtenances, including fenders, cleats, dock boxes, and utility lines, will be installed on the docks. When complete, the utilities are connected to the shoreside services.

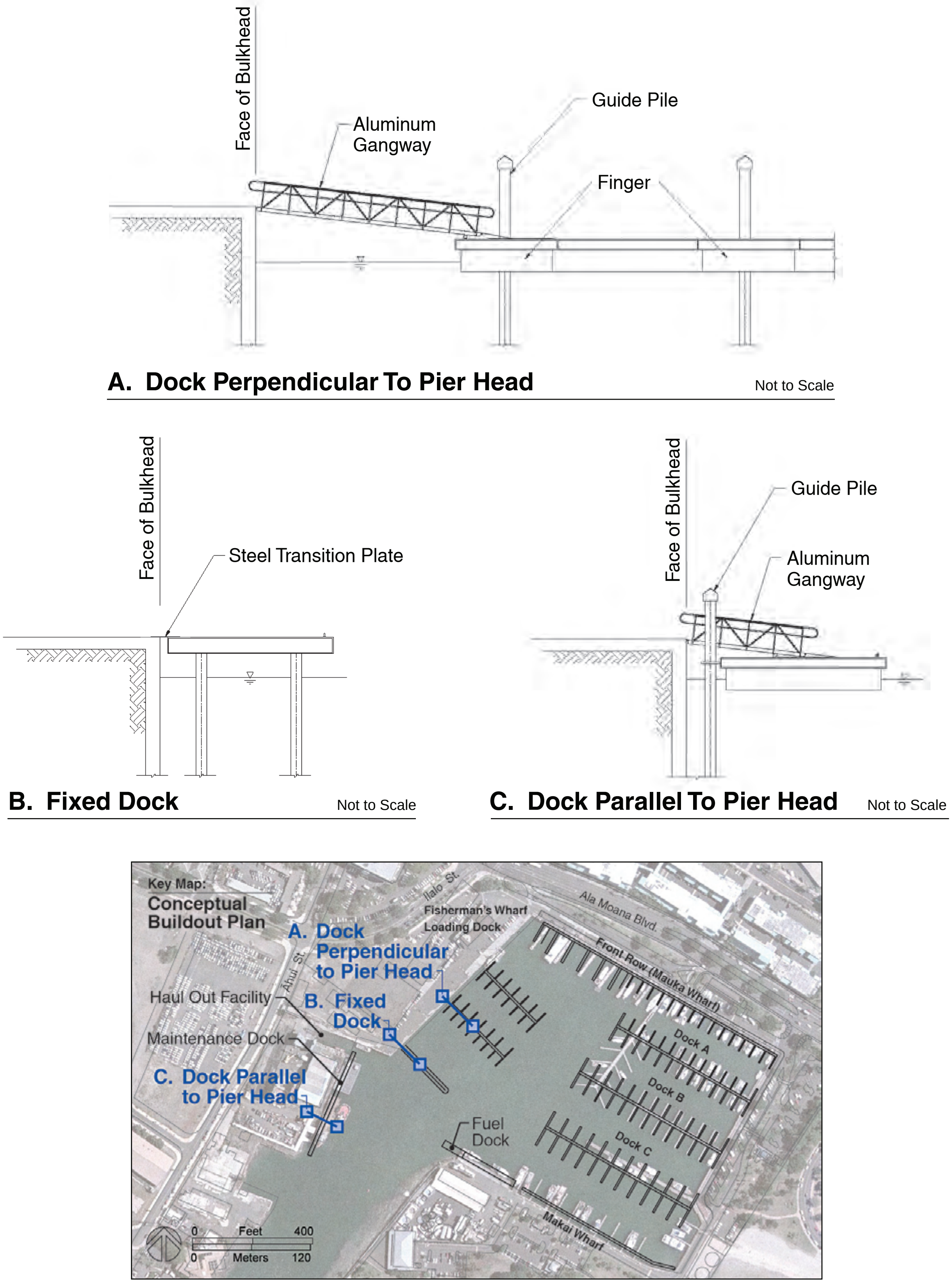
Floating Dock Construction. Floating dock systems are widely utilized (including at the State Department of Land and Natural Resources' (DLNR) Ala Wai, Ke'ehi and Hale'iwa Boat Harbors) and generally consist of a pre-fabricated buoyant dock that floats on the water's surface and is held in place by structural guide piles. Floating docks move vertically with water level fluctuations within the harbor.

The installation involves connecting the float modules together in the water, then securing them in place by driving the mooring or guide piles. The pre-fabricated segmented floating docks are connected to each other on the water, towed into position, and then secured in place by guide piles either externally (for narrow docks) or through a hole within the decking (for wider docks) Because the weight of the floats is supported by the water, these docks require fewer piles than fixed docks. The new floating docks will be moored by piles along the main pier walkways at approximately 50 ft on center, and may also include piles at the ends of all finger docks (although some rigid systems do not require guide piles at the finger docks). The new guide piles are assumed to be 16.5-in or 20-in octagonal pre-stressed concrete piles.

Once the floats are secured, the topside work is carried out to install the gangway and connect the utility lines attached to the floats to the shoreside tie-ins. See Figure 5 for schematic cross-sections of a typical floating dock connection to the adjacent bulkhead.

Construction Equipment. The following construction and mechanical equipment are anticipated to be used in the project's construction.

- Landside crane for loading/offloading
- Dump trucks to haul demolition debris from site
- Flat bed trucks for occasional deliveries



Source: Moffatt & Nichol, July 2010.

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Figure 5

Typical Schematic Dock Cross-Sections

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- Concrete delivery trucks to fabricate cast-in-place concrete structures
- Marine derricks fitted with 1-2 cranes, and lay-by barges for material handling
- Typical construction hand tools
- Equipment such as pavement cutter, trencher, compacter, paver, etc. for limited shoreside trenching to extend existing utility lines to new docks. This work is expected to be minor, so use of this equipment would be for brief durations.

Best Management Practices. During the construction period, industry-standard BMPs will be employed to avoid or minimize adverse effects on marine resources. A BMP plan will be developed in consultation with Federal and State regulatory agencies to address specific conditions of the work proposed at the project site. Although details of a BMP plan are not determined yet, at a minimum, the construction activities will be conducted in a manner that does not cause violations of State water quality standards. Best management practices, such as turbidity barriers, will be installed and maintained at appropriate locations around the in-water work and remain in place until construction activities at the work location is completed. The contractor will also place construction debris control devices such as booms, tarpaulins, floats, or other devices as necessary to prevent construction debris from entering the water and airborne materials from leaving the immediate vicinity of the site. The contractor will be responsible for clean-up of any materials deposited outside the work area or in the water. The contractor will also abide by all applicable local environmental protection standards, laws and regulations.

2.6 Use of Public Lands or Funds

The project will occur on and above State-owned fastlands and submerged lands, and State funds will be used to construct the project. Therefore, it is subject to the State's environmental review process. An EISPN was published in the State Office of Environmental Quality Control's *Environmental Notice* on April 8, 2010. The proposed action was determined to require the preparation of an EIS based on the significance criteria set forth in Section 11-200-12 of Title 11 Chapter 200, HAR, State DOH. This EIS was prepared in compliance with Chapter 343, HRS, as amended, and the EIS regulations promulgated by Chapter 200 of Title 11, Hawai‘i DOH.

Chapter 3: NATURAL ENVIRONMENT: ENVIRONMENTAL SETTING, PROBABLE IMPACTS AND MITIGATION MEASURES

The following is a description of the existing natural environment, assessment of probable impacts, and potential measures to mitigate potential adverse impacts resulting from the proposed project.

3.1 Climate and Air Quality

3.1.1 Affected Environment

Honolulu's climate and that of the project area are typical of the leeward coastal lowlands in Hawai'i--characterized by mild temperatures, abundant sunshine, infrequent severe storms, moderate humidity, and persistent northeasterly trade winds. For most of Hawai'i there are two seasons, summer from May to October and winter from November to April. August is the warmest month, with an average high of 89° Fahrenheit (°F) and a low of 75°F, while the coolest month is February with an average high of 81°F and an average low of 65°F. Typically, the most rainfall occurs between the months of November and April. The mean annual rainfall is approximately 23 inches. The relative humidity ranges between 56 and 72 percent. Prevailing trade winds are from the northeast throughout most of the year, with occasional "*Kona*" winds bringing warm humid air from the south (EDAW, Inc. 2009).

Ambient air quality pertains to the purity of the general outdoor atmosphere, external to buildings, to which the general public has access. The U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide, lead, ozone (O_3), and particulate matter. In addition to these pollutants, the State of Hawai'i has an ambient air standard for hydrogen sulfide. State air quality standards are generally more stringent than national standards.

The State DOH is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the State and Federal ambient air quality standards. The DOH collects data on selected pollutants from a statewide network of monitoring stations. There are six air quality monitoring stations on the island of O'ahu. The two monitoring stations closest to the project area are the Honolulu station (approximately one mile to the north) and the Sand Island station (approximately one mile to the northwest). The Honolulu station is located in downtown Honolulu on Punchbowl Street in a busy commercial, business and government district. This station collects and monitors samples of sulfur dioxide, CO, and particulate matter that are 10 microns and 2.5 microns or less in diameter (PM_{10} and $PM_{2.5}$). The Sand Island station is located in a light industrial, commercial and recreational area about two miles downwind of downtown Honolulu near the entrance to the Sand Island State Recreation Area. This station collects and monitors samples of O_3 and $PM_{2.5}$.

According to the State DOH's annual air quality data summary (State of Hawai'i 2008) in 2008, criteria air pollutant levels were well below State and Federal ambient air quality standards at all State and local air quality monitoring stations.

3.1.2 Probable Impacts

The proposed action will not significantly impact climate or air quality because it would not introduce any new major air pollution sources, and the existing ambient air quality at the project area is likely well within Federal and State standards, according to air quality data from the monitoring station nearest the project area and overall ambient air quality data for the State of Hawai'i. The proposed action will not include new air pollution sources that require additional air quality permits. The principal source of short-term air quality impacts will be construction activity, including construction vehicle emissions and particulate emissions associated with earth moving operations. These potential impacts will be minor and of short duration. All construction activities will comply with the provisions of HAR §11-60.1-33 (Fugitive Dust).

3.2 Geology, Topography, and Bathymetry

3.2.1 Affected Environment

Geology. There are four major geomorphic provinces on the island of O'ahu: Ko'olau Range; Wai'anae Range; Schofield Plateau; and Coastal Plain. The project area lies within the Honolulu coastal plain, which is primarily composed of marine sediments deposited on lavas when the sea levels were higher during the mid-Pleistocene era (Stearns 1985).

Topography. The topography of the fastland areas surrounding the project site is flat, with elevations between 5 and 6 ft above mean sea level (msl).

Bathymetry. Kewalo Basin is a man-made, medium-draft harbor created by dredging the submerged reef and filling areas that form the south and east sides of the harbor basin. Its design depth is 20 ft; however natural siltation may have reduced the available draft in some parts of the harbor. The entrance channel, at the southwest corner of the harbor, is approximately 260 ft wide and 20 ft deep. A 150-ft jetty extends toward the southwest from the triangular filled area that forms the south boundary of the harbor and east boundary of the entrance channel. This jetty provides additional protection of the entrance channel.

On the seaward side of the basin, a reef area with an average depth of 3 ft below Mean Lower Low Water (MLLW) extends 1,500 ft east and west and about 900 ft south from shore. This reef area is a recognized surfing area (see discussion of recreational resources in Section 4.6.

A bathymetric survey of the harbor was conducted for the project and indicated that the seabed within the harbor generally meets or exceeds the published minimum harbor depth of 20 ft, with the exception of the *mauka*-Diamond Head corner of the basin where water depths are 16 to 18 feet.

3.2.2 Probable Impacts

The proposed action will not alter existing geological, topographical or bathymetric conditions at the project area or vicinity. Aside from new connections to existing utility lines and the potential installation of fuel storage tanks, no upland development is included in the action. No dredging or filling is proposed for the project. The only changes to the submerged lands will be the removal of existing piles and installation of new piles.

3.3 Soils and Marine Sediments

3.3.1 Affected Environment

3.3.1.1 Soils

The project area does not include any areas with exposed soils. The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service) classifies the fastlands within the project site as "Fill Land, mixed" (FL). The NRCS describes Fill Land as consisting of areas filled with material dredged from the ocean or other sources. It typically occurs near Pearl Harbor and in Honolulu adjacent to the ocean, and is used for urban development.

3.3.1.2 Marine Sediments

Sediment sampling and analysis of constituents was conducted by Marine Research Consultants in February 2010 to evaluate the presence of pollutants (Appendix A). Comparison of the analytical results with regulatory guidance was conducted by Helber Hastert & Fee, Planners. The findings of the sampling and analysis are summarized in this section and Section 3.3.2.

The entire floor of Kewalo Basin and inner entrance channel is covered with a layer of fine-grained muddy sediment which has accumulated in the man-made basin. Analyses of sediment samples collected from three stations within the inner basin indicated similar results, indicating that the distribution of chemical constituents within the sediment is relatively homogeneous throughout the inner basin (see Appendix A for station locations and detailed constituent levels). One sediment sample was collected from each of three stations within the inner harbor in February 2010 (Marine Research Consultants, Inc. 2010). The three sediments samples were submitted to an analytical laboratory for chemical analyses using standard methods.

Analyses included the following: (1) ignitability; (2) Toxicity Characteristic Leaching Procedure (TCLP) for five metals (arsenic, cadmium, chromium, lead, nickel, and mercury); (3) oil and grease; (4) total recoverable petroleum hydrocarbons (TRPH); (5) total extractable petroleum hydrocarbon (TEPH) fingerprint; (6) organochlorine pesticides; (7) polychlorinated biphenyls (PCBs); (8) volatile organic compounds (VOCs); (9) acid/base neutral extractables (for semi-volatile organic compounds [SVOCs]); (10) total and amenable cyanide; (11) total sulfide; (12) paint filter test; (13) total organic carbon; and (14) reactive cyanide. Analytical results are summarized in the following paragraphs.

Resource Conservation and Recovery Act (RCRA) Waste Characteristics. Analytical results for TCLP metals analyses for all three sediment samples were below detection limits and the RCRA regulatory levels for these metals. In addition, all three sediment samples were found to be below the RCRA regulatory levels for ignitability, reactivity, and corrosivity. Analytical results for the three sediments samples revealed that the concentrations of organochlorine pesticides, VOCs, and SVOCs for the compounds tested are below RCRA regulatory levels for those compounds. However, not all compounds included in Table 1 of 40 CFR 261.24 (Toxicity Characteristic) were analyzed. It is possible that the excluded compounds could be present in the sediment.

Oil, Grease, Petroleum Hydrocarbons. Analytical results for all three sediment samples revealed detectable concentrations of oil and grease. Results ranged from 1,050 to 1,430 milligrams per kilogram (mg/kg). There are no regulatory levels or established (estimated) concentrations for which the presence of oil and grease are predictive of toxicity. Oil and grease includes fats as well as petroleum products and other compounds.

Analytical results for TRPH revealed concentrations ranging from 124 to 228 mg/kg. There are no Federal or State regulatory levels associated with TRPH in marine sediments. On land, the State DOH has established soil action levels[1] (SALs) for various scenarios; the most conservative SALs for petroleum products in soil range from 100 mg/kg for gasolines and middle distillates and 500 mg/kg for residual fuels. In the absence of Federal or State regulatory levels for TRPH in marine sediments, the SAL can be used as a basis of comparison for the sediment sample results.

Analytical results for TEPH fingerprint revealed detectable concentrations of motor oil (e.g., residual fuel) ranging from 113 mg/kg to 1,776 mg/kg in two of the sediment samples. In addition, this analysis revealed concentrations of diesel of 17 mg/kg to 377 mg/kg in two of the sediment samples. These results suggest that the concentrations of oil/grease and TRPH detected in the samples are largely attributable to middle distillates (e.g., diesel fuel or motor oil) and residual fuels. Only one sample had concentrations exceeding the SALs for these compounds.

Metals. Analysis of metals concentrations used sediment quality guidelines (SQG) developed by NOAA. SQGs were derived and compiled from studies performed in both saltwater and freshwater sediments. These guidelines include screening values that indicate

[1] Soil action levels are concentrations of contaminants in soil (established by the State DOH) below which no additional evaluation or remediation is warranted.

concentrations below which adverse effects to marine fauna are not likely ("effects range-low" (ERL)), and concentrations above which adverse effects are more likely ("effects range-median" (ERM)).

For all three sediment samples, total concentrations (versus TCLP concentrations) of copper, lead, zinc and mercury exceed the SQG ERM for marine sediments. In addition, in two of the samples, the total concentration of cadmium exceeds the ERM.

Organochlorine Pesticides. Concentrations of 4,4-DDT, a pesticide, were detected in all three sediment samples at concentrations ranging from 0.005 mg/kg to 0.013 mg/kg. These concentrations exceed ERL and/or the ERM and, therefore, may present a concern for aquatic fauna within Kewalo Basin. Concentrations for all other organochlorine pesticides analyzed were below the detection limits; however, the detection limits for 4,4-DDD and 4,4-DDE are both above ERL for those compounds. Therefore, it is possible these compounds could be present in concentrations above the ERL.

PCBs. PCB-1260 was detected in all three sediment samples in concentrations that exceed the ERL for that compound. The detection limits for all other compounds exceeds the ERL; therefore, it is possible that these compounds may be present in concentrations that exceed the ERL.

VOCs. VOCs were not detected in any of the three sediment samples. There are no ERL or ERM values established for the VOCs analyzed. The State DOH has established SALs for 41 of the VOCs analyzed. The majority of the detection limits for these VOCs were below the SAL indicating that these compounds are not present above SALs; however, for five of the compounds, the detection limits were greater than the SAL indicating that these compounds may possibly be present in concentrations that exceed the SAL.

SVOCs. SVOCs were not detected in any of the three sediment samples. There are generic ERL and ERM values for polynuclear aromatic hydrocarbons (PAHs), which were used as a basis for comparison for SVOC compounds not having a specific ERL and ERM value. The majority of the detection limits are below the ERL values and they are all below the ERM values. However, for nine of the compounds, the detection limits were greater than the ERL indicating that these compounds may possibly be present in concentrations that exceed the ERL.

3.3.2 Probable Impacts and Proposed Mitigation

3.3.2.1 Soils

Because the project will have minimal disturbance to the fastland areas (generally limited to localized repairs to existing bulkheads and connecting floating docks to existing bulkheads), no adverse impacts to soils are expected either during the construction or operational periods. There may be some trenching on the peninsula *makai* of the Makai Wharf associated with the possible installation of fuel storage tanks to serve the proposed fuel dock. Soils in this area are comprised of fill land. Excavated soils would be disposed of in accordance with applicable State and county regulations.

3.3.2.2 Marine Sediments

During the construction period, pre-drilling and pile-driving activities associated with construction may result in temporary increases in sediment resuspension and increased turbidity within the water column.

Based on the results of the RCRA Waste analyses, any marine sediment waste generated as part of the proposed action (e.g., from pre-drilling prior to pile driving) is not expected to be characteristic of a hazardous wastes; nevertheless, the material will be handled, tested and properly disposed of in accordance with applicable State and Federal requirements.

Based on the results of the oil and grease, TRPH, and TEPH fingerprint analyses, any sediment waste derived from the proposed action may have total petroleum hydrocarbon (TPH) concentrations that could exceed SALs and, therefore, may require special handling and disposal. If any marine sediment waste is generated that requires upland disposal, these materials will be handled, tested, and properly disposed of in accordance with applicable State and Federal requirements.

Based on the results of the organochlorine pesticides, PCBs, VOCs, and SVOCs analyses for the sediment samples, concentrations of some compounds exceed or may exceed ERL, ERM, and/or SALs. The presence of these compounds in the sediment may adversely affect the aquatic fauna within the basin. The distribution of the compounds may be localized (e.g., limited to the sample areas) or, more likely, may be present throughout Kewalo Basin. Construction activities associated with the proposed action will temporarily increase sediment resuspension. BMPs during these sediment disturbing activities will be in place to limit the resuspension of the sediments and contain the sediment in vicinity of these activities.

During the operational period, increases in vessel traffic and/or vessel size associated with the proposed improvements may result in periodic increases in sediment resuspension and increased turbidity relative to existing conditions. However, because current conditions in the harbor are not suitable for the colonization of anything but highly tolerant fouling organisms, temporary periods of increased turbidity is not likely to significantly reduce the quality of the aquatic environment.

3.4 Groundwater Resources

3.4.1 Affected Environment and Probable Impacts

The project site is not located over a source of drinking water. Therefore, the project is not expected to affect groundwater resources.

3.5 Marine Water Resources

3.5.1 Affected Environment

The project area includes marine waters. The State of Hawaiʻi classifies the marine waters of Māmala Bay as Class A. Objectives of Class A waters are "…that their use for recreational purposes and aesthetic enjoyment be protected. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. These waters shall not act as receiving waters for any discharge that has not received the best degree of treatment or control compatible with the criteria established for this class" (§11-54-3, HAR).

Honolulu Harbor/Shore Areas is listed on the State DOH's Final 2004 List of Impaired Waters in Hawaiʻi, prepared under the Clean Water Act as a §303(d) Listed Waterbody, which identifies "waters which will not attain applicable water quality standards with technology-based controls alone (e.g., water quality limited)." Primary pollutants identified by DOH in Kewalo Basin were nutrients, suspended solids, turbidity, and trash.

Water Quality Sampling. Harbor water quality sampling was conducted by Marine Research Consultants (July 2010). The findings of the assessment are summarized in this section and in Section 3.5.2. The full report is attached as Appendix A.

Water quality was evaluated at 19 stations within the basin and through the entrance channel to the open ocean. Kewalo Basin is classified as an embayment within DOH Water Quality Standards. Water quality parameters evaluated included all of the specific criteria designated for estuaries in Chapter 11-54, Section 06 (Embayments) of the DOH Water Quality Standards. These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO_3^- + NO_2-, hereafter referred to as NO_3^-), ammonium nitrogen (NH_4^+), total phosphorus (TP), chlorophyll a (Chl *a*), turbidity, pH, salinity and temperature. In addition, orthophosphate phosphorus (PO_4^{3-}) and silica (Si) were also reported because these parameters are sensitive indicators of biological activity and the degree of groundwater or surface water mixing.

Water samples revealed patterns of both vertical and horizontal stratification in the concentrations of salinity and several inorganic nutrients (Si and NO_3^-), consistent with groundwater input in the most shoreward part of the basin. Concentrations of Si and NO_3^- within the main basin were consistently elevated in surface samples relative to the corresponding bottom sample, while salinity displayed the opposite trend with lower values at the surface relative to bottom samples. Within and beyond the entrance channel, there was little difference between surface and bottom samples, and the surface concentrations of Si and NO_3^- were substantially less than the levels reported within the basin. Concentrations of NH_4^+ within the basin were generally higher in bottom samples relative to surface samples, likely as a result of metabolic processes of organisms inhabiting the sediment column. Overall, values of turbidity were elevated in bottom samples relative to surface samples collected at the same station, while Chlorophyll *a* was consistently higher at the surface relative to the bottom. Vertical profiles of temperature showed a similar trend, with consistently higher values in surface relative to bottom samples and the highest values at the most inland portions of the basin and decreasing values moving seaward out the channel.

The only constituents with concentrations over State of Hawai'i DOH Water Quality Standards were NO_3^- in several surface samples at stations near the inner shoreline, and NH_4^+ in several bottom samples. The presence of high concentrations of NO_3^- in surface samples (along with depressed salinities) indicates input of low salinity groundwater to Kewalo Basin (groundwater typically contains elevated concentrations of Si and NO_3^- and lower salinity relative to ocean water). Although sample levels that exceed the DOH criteria might be based solely on the input of naturally occurring groundwater or stream water, it is likely that the concentrations of NH_4^+ and NO_3^- may be augmented by subsidies from land-based urban activities.

Other Water Quality Factors. Title 15, Subtitle 4, Chapter 212, Section 112 prohibits the placement, depositing, or discharge of any polluting liquid, gaseous or solid materials, oil, oily waste, and bilge/ballast water (unless it consists of clean water) into the waters of Kewalo Basin. The following spill prevention measures are employed by the harbor manager to reduce the risk of pollutants entering the harbor waters. Fuel delivery companies must have spill prevention equipment available and carry insurance for spill recovery. The harbor manager informs tenants of the availability of used oil, oily filters and debris collection facilities near the Makai Wharf, and has added the capability of recycling oily water.

In spite of these rules and spill prevention measures, spills of oil, oily waste and other hazardous or regulated materials occur on occasion within and near Kewalo Basin. The following protocols are employed when a potential pollutant is discovered in Kewalo Basin waters. The harbormaster is notified, and if the source is clearly visible (e.g., a boater working on a vessel putting particulates into the water or a vessel is discharging oily bilge water), the harbormaster stops the action, informs the party of the harbor rules, and issues a warning letter.

Any fuel or oil discharges are reported to the U.S. Coast Guard (USCG) Sector Honolulu, who then informs the National Response Center (NRC). The USCG Sector Honolulu physically investigates significant incidents. Table 3 summarizes the incidents of releases into or near Kewalo Basin that were reported to the NRC from 2000-2009. Most incidents were reporting the observations of sheens caused by unknown materials in the water.

Table 3
Releases Reported to National Response Center: Kewalo Basin and Vicinity
2000-2009

Year	No.
2000	5
2001	5
2002	3
2003	4
2004	5
2005	5
2006	8
2007	9
2008	4
2009	16
Average	6.4

Source: NRC Reported Incident Data 2000-2009.

The tenant is tasked with the clean up, with assistance from the harbormaster, if needed. Clean up actions include using oil absorbing mats in the water, if deemed beneficial. The harbor manager is acquiring spill response materials such as oil absorbent booms for use in the event of larger spills or discharges.

If the source is not identifiable, the harbormaster records the event in its incident log, and may complete a site investigation sheet in accordance with the NPDES Storm Water Management Program Plan for Kewalo Basin Harbor (see discussion of the NPDES permit for Kewalo Basin Harbor in Section 4.3).

3.5.2 Probable Impacts and Proposed Mitigation

3.5.2.1 Construction Period

Construction activities are expected to temporarily increase turbidity in the immediate project area due to resuspension of sediments into the water column. The increased turbidity may cause temporary exceedences of water quality standards for suspended sediments. However, as discussed earlier, industry-standard BMPs will be employed to reduce the extent of potential water quality impacts associated with construction (see Section 2.5 for discussion of BMPs).

The construction contractor will implement BMPs to minimize water quality impacts to the marine environment. It is anticipated that appropriate construction BMPs, such as the use of sediment retention devices (e.g., silt curtains), will prevent dispersal of resuspended sediment throughout the basin and entrance channel. While construction activities are not expected to result in substantial or long-term effects to existing water quality, industry-standard BMPs (e.g., water quality monitoring to assess compliance with water quality standards before, during and after construction) will be employed during construction to mitigate adverse impacts on the local marine environment. Specific BMPs and mitigation measures will be determined in consultation with Federal and State regulatory agencies during later permitting processes.

3.5.2.2 Operational Period

During the operational period, additional vessel traffic into and out of Kewalo Basin will result from the increase in boat slips. However, it is anticipated that the vessels that generate the greatest volumes of trips (e.g., excursion boats, including charter fishing) will increase only slightly in number. This is due to the likelihood that the current number of commercial operators (including excursion boats and commercial fishing boats) is close to its demand capacity, as evidenced by the harbor's vacancy history. Increases in vessel traffic or vessel size associated with the proposed improvements may result in periodic increases in turbidity relative to existing conditions. However, since existing conditions within the harbor are beyond the threshold for colonization of any but highly tolerant fouling organisms and the existing marine communities in the harbor are receiving exposure to such sediments, possible increases in turbidity or other physical/chemical alteration of the water column is not likely to exacerbate current conditions. Furthermore, given that the residence time of water in the harbor is long and that turbidity generated by vessel movements is typically contained within the harbor (and does not reach the entrance channel), changes to the pollutant and sediment load extending outside the harbor are expected to be minimal. Compliance with applicable Federal and State water quality regulations and spill prevention measures during the operational phase will minimize the likelihood of operational period water quality impacts. In addition, the harbor operator will be able to limit the draft of any additional vessels in the basin to minimize potential turbidity increases.

The proposed fueling dock along the Makai Wharf would introduce the potential for a release of petroleum into harbor waters in the event of a leak, tank breach, operator error during fueling or maintenance, or other incident. As described in Section 2.3, standard fuel tank specifications will reduce the risk of releases into the waters of Kewalo Basin. They may include double walled construction of tanks and pipes, monitoring of fluids in the interstitial space between the tank or pipe walls, tank inspection ports, automatic and manual flow cut off at the tanks as well as at the pumphead, tank overflow protection, use of corrosion resistant materials, periodic inspections, meter reconciliation, automatic leak detectors and alarms, and operational practices (e.g., secured access, no nighttime operations, assisted pumping). Because the fueling dock is not planned until a later phase of the project, its specifications are not yet available (e.g., capacity, standard fail-safes and redundancies, BMPs, etc.). Specific BMPs and SOPs for the fueling dock will be identified as a part of the facility's future CWA Section 401 Water Quality Certification process. Because the dedicated fuel dock would be subject to stringent permitting requirements and spill prevention controls, it would provide an alternative to the current system of fuel delivery (by truck) that is likely to reduce the risk of petroleum product releases to the environment.

3.6 Wind and Wave Regime

3.6.1 Affected Environment

The entrance channel to Kewalo Basin is exposed to storm-generated waves from the south and west, which can make navigation difficult for small craft using the harbor. Navigational problems in the harbor are caused by: cross-currents generated in the channel in front of the existing jetty; peaking and breaking waves in the entrance channel, and cross-currents in the outer portion of the channel, caused by littoral currents along the outer edge of the reef, which create eddy currents (U. S. Army 1975).

The tide range in Kewalo Basin between Mean Higher High Water (MHHW) and MLLW is 1.9 ft (0.58 m). The maximum observed water level is 3.39 ft (1.034 m) above MLLW and the minimum observed water level is -1.41 ft (-0.429 m), MLLW. However, the water levels in Kewalo Basin are also controlled by a combination of storm surge related to hurricane passage through the area and Kona storm events, in addition to variations due to the astronomical tides.

From observations, the maximum height of an incoming offshore wave that can approach the inlet channel without breaking is about 10 ft (Fallon, et al 1971). The maximum transmitted wave heights inside the basin were estimated to be about 3-4 ft based on modeling results for this offshore wave climate. These estimates appear to be consistent with anecdotal observations.

The maximum water level inside the basin is estimated by including a Mean High Water tide (considered to be a normal high tide level), a hypothetic storm surge, and the wave effects. It is possible that the maximum water level could reach higher levels due to higher tides and storm surge as well as the sea level rise, although the estimate of sea level rise is relatively small at 0.49 feet in 100 years as reported by NOAA (NOAA 2008).

3.6.2 Probable Impacts

Because the construction activities will be limited to the confines of the harbor, no impacts to waves and coastal processes outside the entrance channel are anticipated. The surfing breaks outside the harbor will not be impacted.

3.7 Noise

An environmental noise assessment was conducted by D.L. Adams Associates to characterize the existing atmospheric noise environment and assess the potential impacts of the project on existing noise sensitive areas. The findings of the assessment are summarized below and the full report is attached as Appendix B.

An evaluation was also conducted to determine the likely effects of construction activities of the proposed action on the underwater noise environment, particularly for marine protected species and SCUBA divers. A summary of findings is presented in Sections 3.7.1.2 and 3.7.2.2, and the full report is included as Appendix C.

3.7.1 Affected Environment

3.7.1.1 Atmospheric Noise

The environmental noise assessment included measurements of ambient atmospheric noise levels in two different locations in April and May 2010 to assess the existing acoustical environment on or near the project area (at the border between Ala Moana Beach Park and Kewalo Basin Park entry road, and at the Honolulu Children's Discovery Center). Continuous, hourly averaged equivalent sound levels were recorded at each location. The noise measurements indicated that the project area currently experiences noise levels typical of an urban environment that vary with the time of day and vehicular traffic patterns on Ala Moana Boulevard. Daytime noise levels measured at the project area ranged from 59 A-weighted decibels[2] (dBA) to 69 dBA, where the average day-night level, L_{dn}, was 67 dBA.

3.7.1.2 Underwater Noise

Protected Species. As described in Section 3.8 Marine Biological Resources, there are protected species known to occur in the marine waters seaward of Kewalo Basin. The species of concern in this evaluation are humpback whales and spinner dolphins (order *Cetacea*), Hawaiian monk seals (sub-order *Pinnipedia*), and green sea turtles (order/genus *Chelonia*). Whales would potentially be present in waters outside the harbor entrance channel in winter months, primarily between November and April. Dolphins could be present at any time of the year, but would not normally be expected within the harbor. Hawaiian monk seals are the only pinniped species known to inhabit O'ahu coastal waters, and may be present within the harbor, its entrance channel or waters outside the harbor. However, they are expected to enter the harbor only rarely. Sea turtles may be present at Kewalo Basin within the entrance channel or the harbor. There have been commercial and recreational vessel operations in and around Kewalo Basin for the past 90 years since its initial construction. During this time, it is likely that marine animals in its vicinity have become habituated to underwater sound levels generated by the fishing, excursion, and pleasure craft transiting the nearshore waters.

Humans. There are also SCUBA diving and snorkeling activities that take place at various locations in inshore waters on either side of Kewalo Basin, as well as further off-shore.

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[2] Studies have shown conclusively that at equal sound pressure levels, people are generally more sensitive to certain higher frequency sounds (such as made by speech, horns, and whistles) than most lower frequency sounds (such as made by motors and engines) at the same level. The A-weighted scale was developed to address people's differing sensitivities to higher or lower frequency sounds by adjusting the sound level in each frequency band in much the same manner that the human auditory system does. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound and has some correlation with the sensitivity of the human ear to that sound. Different sounds with the same A-weighted sound level are perceived as being equally loud.

There are at least two dive spots located about 200 to 300 yards off-shore west of the channel used by commercial dive operators and recreational divers (see discussion in Section 4.6 Recreational Resources).

3.7.2 Probable Impacts and Proposed Mitigation

3.7.2.1 Atmospheric Noise

The proposed action is expected to result in construction noise levels that exceed the daytime maximum permissible noise limits at the property line. Intermittent noise from project construction activities will be audible in the vicinity of the project site. The increase in ambient noise levels at the nearest residential condominiums that have line-of-sight to the project site is estimated at 1 to 2 dB, which is an insignificant increase. The dominant noise sources during construction will be from the vibratory hammer used during the demolition stage and the pile driver used during the dock installation stage, when ambient noise levels may increase by up to 22 dB over existing levels. This will likely cause annoyance to people who participate in activities at neighboring parks, depending on their distance to the project site. However, noise from construction activities will be short term and must comply with State DOH noise regulations. During breaks between pile driving and extraction activities, ambient noise levels should not significantly differ from existing ambient noise levels. A permit will be obtained from the State DOH for the operation of construction equipment and permit conditions will be complied with.

The traffic assessment concluded that the project would not appreciably increase traffic volumes on roadways surrounding the project site, specifically, Ala Moana Boulevard, Ward Avenue, and ʻĀhui Street (Appendix E). Therefore, an increase in traffic noise due to the project is not expected after full buildout of the project.

3.7.2.2 Underwater Noise

Protected Species. Pile driving during the construction period would comprise the project's greatest source noise of concern in the underwater environment, as it has the potential to adversely affect marine mammals in nearshore waters as well as humans engaging in SCUBA diving or snorkeling. Therefore, the underwater noise evaluation calculated the sound energy levels anticipated from pile driving using published values associated with the typical pile driver and diameter of pile to be used. The noise evaluation was conducted at a planning level to determine the geographical limits of potential underwater noise impacts on humans and protected species. In addition to using standard noise propagation calculations and published criteria values, the evaluation used procedures consistent with NOAA National Marine Fisheries Service (NMFS) methodology for calculating noise spreading loss (i.e., cylindrical spreading model) and calculated radii within which sensitivity criteria would be exceeded for protected species and humans.

Because Kewalo Basin is essentially a fully enclosed harbor with the exception of a 260-ft wide channel, the evaluation estimated both 1) noise propagated within the harbor and 2) noise propagated through the harbor entrance channel, if the noise levels exceeded the criteria values at the entrance channel.

The frequency and intensity of the sound energy generated by pile driving is primarily a function of the type and size (diameter) of the piling, the mechanism of its driving (e.g., vibratory, hydraulic hammer, diesel drop hammer), and the hardness and type of substrate through which the pile is being driven. The analysis considered representative types of pilings (20-in concrete octagonal with cushion block and 16-in concrete octagonal with cushion block), all driven by diesel drop hammer. These types of piles are likely to be used in the proposed action.

To determine the potential impacts from sound energy levels (SELs) generated by pile driving, the noise propagated from the pile driving was compared with published criteria values for harassment of the protected species of concern (i.e., whales, dolphins, seals, and turtles). Harassment level noise for cetaceans (whales and dolphins) and pinnipeds (seals), as defined by NMFS, is 160 decibels (dB) root mean square (rms) referenced to 1 micro-Pascal. Definitive criteria on harassment level noise for sea turtles have not been published; however NMFS applies an interim protective standard for sea turtles of 160 dB, which was used in the underwater noise assessment.

Calculations were made to determine the radii around each underwater noise source within which the criteria SEL value of 160 dB for protected species would be exceeded (i.e., SEL within the radii would be >160 dB). The findings indicate that the area within 54 meter (m) (177 ft) of the 20-in concrete pile being driven by diesel drop hammer would be exposed to 160 dB or greater. For the 16-in piles, the critical radius is 34 m (112 ft).

Criteria SEL values for protected species are not likely to be exceeded outside the harbor entrance. Figure 6 shows the 54-m radii around representative construction points within the harbor. At the construction point closest to the harbor entrance, the calculated noise levels outside the harbor do not exceed criteria values for protected species. Although it is unlikely that protected species would be found within the radii of concern, several types of mitigation could result in sound level reductions of 10 to 20 dB, when applied at the noise source. These include pre-drilling, use of vibratory drivers, pile cushioning (which was incorporated into the calculated SELs for the 20-in and 16-in concrete piles), and bubble curtains. In addition, work management mitigation may also be considered, such as performing work only during daylight hours to allow visual survey of the affected area for species of concern. Specific mitigation measures and BMPs will be determined in consultation with the appropriate resource and regulatory agencies during the Department of the Army and SMA permitting processes.

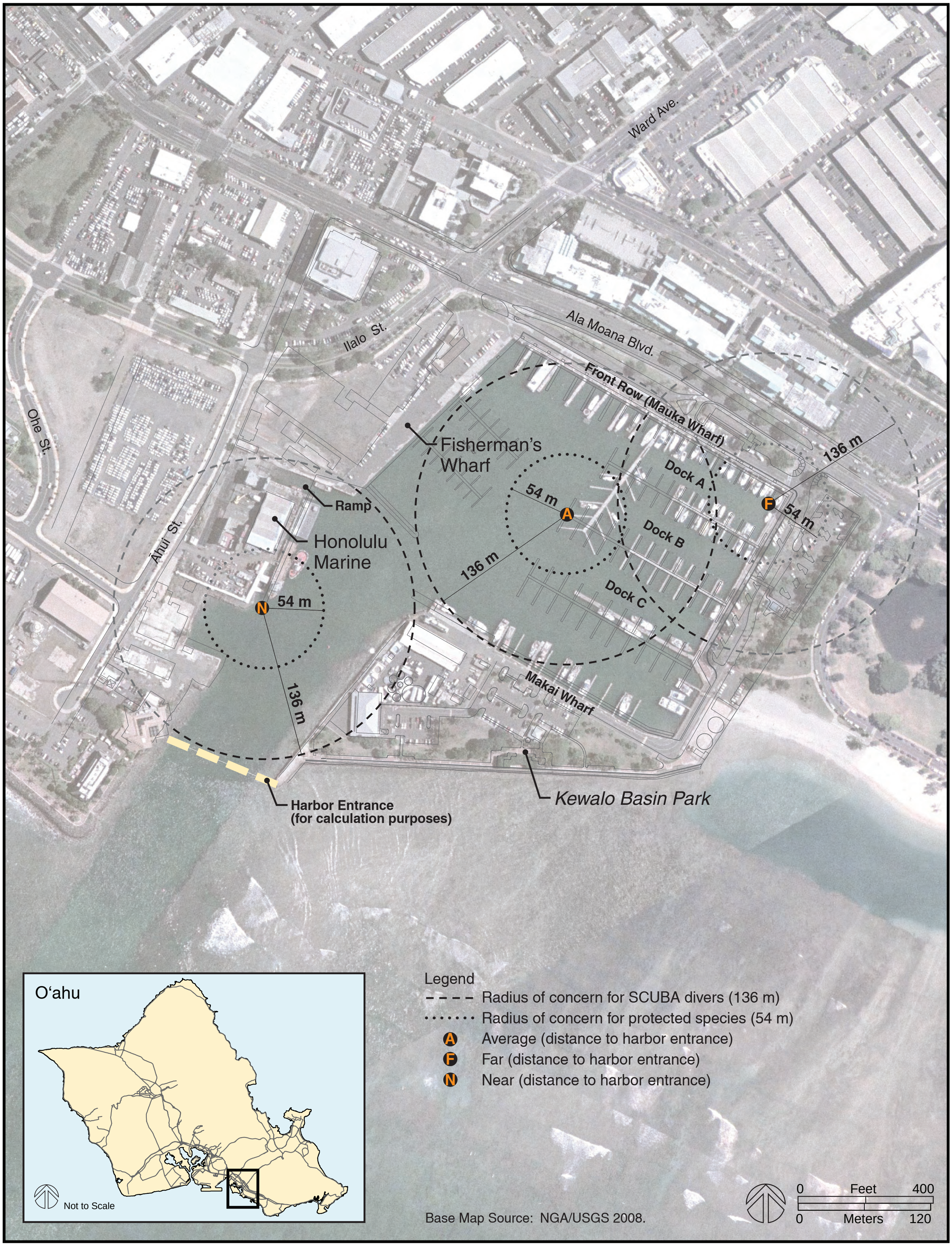

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Figure 6

Underwater Noise Radii of Concern

Hawai'i Community Development Authority

During the operational period, there will be additional vessel traffic transiting the Kewalo Basin channel; however, the daily vessel traffic is unlikely to increase significantly due to the expected composition of the tenants. As described in Section 4.1 Harbor Operations and Navigation, the bulk of vessel traffic is comprised of commercial (excursion and charter) vessels that operate throughout the day. However, most of the future tenant growth is expected in pleasure craft tenants, who generally use their boats on a much less frequent basis (e.g., once a week or less). Because the future underwater noise environment would not significantly differ from existing conditions, adverse operational period underwater noise impacts to protected species are unlikely.

Humans. The calculated SELs were also used to estimate impacts of construction-related underwater noise on human SCUBA divers. Other than occupational settings, there are no specific regulatory limits for underwater noise exposure on humans. However, research has been conducted to assess the potential effects from occasional exposure in a recreational setting (NSMRL 2002 in Goody 2010) (see underwater noise evaluation in Appendix C for details). The results of the research indicated that Sound Power Levels (analogous to SELs) below 166 dB are tolerated by bare-headed divers, but based on subjective ratings, recreational divers should not be exposed to SELs higher than 154 dB.

The underwater noise calculations indicate that the radius within which recreational SCUBA diving advisory levels would be exceeded (i.e., >154 dB) is 136 m (446 ft) for the 20-in piling. As shown in Figure 6, at the construction point closest to the harbor entrance, this radius does not extend outside the harbor entrance. Therefore, construction period underwater noise is not expected to adversely affect recreational diving in the vicinity as recreational diving is not permitted within the harbor or entrance channel. The increases in vessel traffic due at project buildout are not likely to increase underwater noise risks to SCUBA divers in the vicinity of Kewalo Basin as the future underwater noise environment would not significantly differ from existing conditions.

3.8 Marine Biological Resources

A marine biological inventory of Kewalo Basin and harbor channel was conducted by Richard Brock, Ph.D. (July 2010) to identify marine communities and to assess potential impacts of the proposed action on marine resources within and immediately seaward of the harbor. The study identified threatened and endangered species in the survey area, as well as the presence of resources utilized by protected species that could be affected by the proposed action. In addition, a baseline assessment of the biotic community composition in Kewalo Basin and its nearshore vicinity (e.g., corals and fouling communities) was conducted concurrently by Marine Research Consultants. The findings of the assessments are summarized in this section and Section 3.8.2. The full reports are attached as Appendix D (Marine Biological Inventory) and Appendix A (Baseline Assessment of Water, Sediment and Biotic Composition).

3.8.1 Affected Environment

In this section, the marine physical and biotic conditions are discussed geographically, starting from the area closest to the proposed construction activity (Kewalo Basin), and moving seaward (Entrance Channel and Seaward of Channel). The affected marine biological environment is also described in terms of biological species of concern (Protected Species and Fisheries).

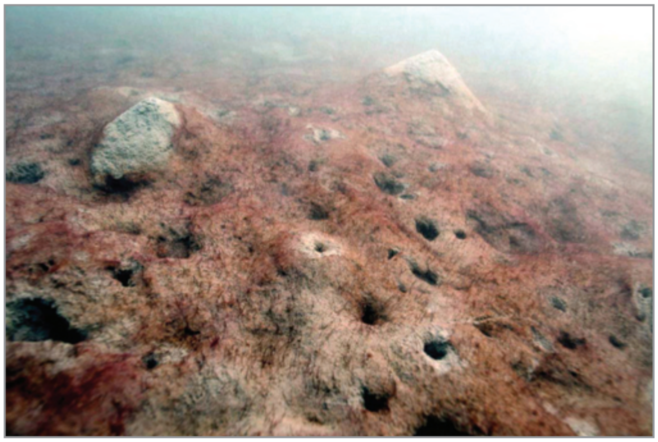
3.8.1.1 Kewalo Basin

Biotic community composition was evaluated by conducting reconnaissance swims throughout the harbor. The survey found that Kewalo Basin is biologically degraded with few native species present. The inner harbor consists of a soft-bottom substratum comprised of a mix of mud, silt, muddy sand and refuse, and a hard substratum formed by the submerged portions of steel bulkheads, concrete piles and refuse (shopping carts, bicycles, tires, etc.). The composition of the marine communities inhabiting the man-made structures is generally similar throughout Kewalo Basin.

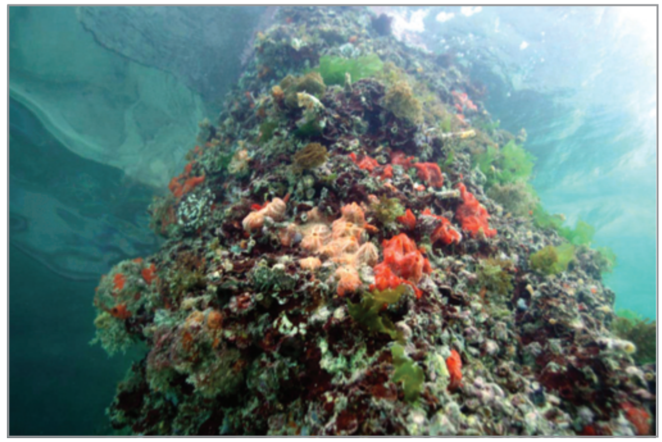
Most of the harbor bottom consists of fine-grained muddy sand covered with a thin film of reddish-brown cyanobacteria. This film was broken by holes and burrow mounds excavated by a variety of organisms such as worms, shrimp, and crabs (see Figure 7A). The harbor bottom differed only along the innermost margin of the northwest corner, where a raised bench is covered by a mix of sand and shell debris. There were no living stony corals observed on any of the solid surfaces within Kewalo Basin.

The upper surfaces of concrete docks and pilings within the intertidal range were either bare or covered with a veneer of barnacles and oyster shells. The submerged pilings, as well as all other permanently submerged structures, were encrusted with a wide variety of fouling organisms, including bryozoans, sponges, hydroids, worms and algae (Figure 7B). None of the encrusting organisms observed are considered rare or of any commercial or subsistence importance. No reef-building corals were observed colonizing any of the solid surfaces within Kewalo Basin. Many of the visually-dominant species in the inner harbor are alien. These alien species are competitively superior to native species, and occupy much of the available hard substratum. See Appendix D Marine Biological Inventory for species list.

Very few fishes were observed in the inner Kewalo Basin harbor, and other than the dominant alien black-chin tilapia (*Sacotherodon melanotheron*), most fish species were found in proximity to the harbor entrance channel. The alien black-chin tilapia was the most common species observed. Most native fishes were found around in sheltered areas (e.g., dock pilings, under the wharves, around larger refuse such as shopping carts, bicycles, etc.); however, none of the native fish species were common in the inner harbor, and most



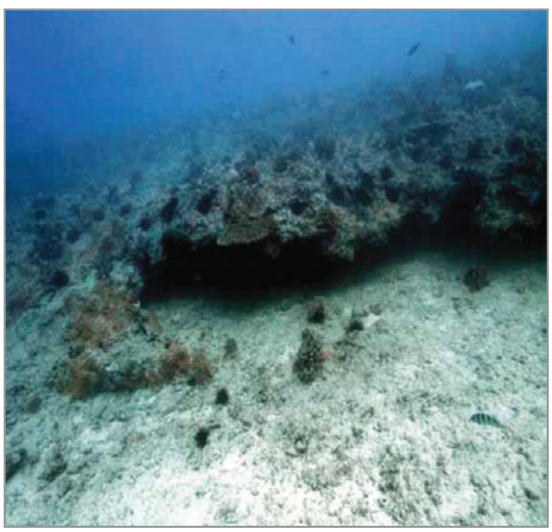
7A Mud bottom covered with film of cyanobacteria and numerous burrows and mounds from benthic fauna.



7B Fouling communities on pilings in Kewalo Basin. Green alga is *Ulva fasciata*. Orange sponges are likely *Mycale armata*.

7C Eastern edge of Kewalo Basin entrance channel.

7D Isolated coral colony of *Pocillopora* sp. near seaward end of entrance channel on eastern wall.



7E Limestone ridge with undercut that could be used by green sea turtles (located 500 m offshore of Kewalo Basin); however, no evidence of turtle resting was observed (i.e., "worn" substratum).

Sources: 7A-7D Marine Research Consultants 2010.
7E Brock 2010.

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sightings were comprised of one or two individuals (see Appendix D Marine Biological Inventory for list of observed species).

3.8.1.2 Entrance Channel

The degraded conditions and marine communities common in the inner harbor continued in a seaward direction into the entrance channel. The physical and biotic composition of the harbor entrance channel differed from that of the harbor. The channel walls consisted of sediment-covered rubble interspersed with patches of sandy mud (Figure 7C). The sediment on the hard substrata was covered in algal turf. The channel floor consisted predominantly of a layer of fine-grained sandy mud similar to that of the harbor floor. Moving seaward within the channel, the bottom cover of mud decreases and is replaced with an increasing cover of rocks on a hard limestone platform. In general, the diversity of native species increases moving seaward within the channel. Several isolated colonies of living corals were observed in the channel (Figure 7D), with the first small colony (*Pocillopora damicornis*) located on the east side of the channel, about 150 m (490 ft) seaward of the Makai Wharf. On the western side of the channel the first coral colonies were observed at a location fronting the John Dominis Restaurant. The marine communities change rapidly to the usual suite of Hawaiian reef species as one moves seaward from the channel, reflecting the improving marine habitat conditions outside the harbor and channel.

3.8.1.3 Seaward of the Channel

The offshore areas of Kewalo Basin are dominated by hard limestone substratum which begins at the shoreline and continues seaward to a depth of about 12 m (40-ft) on the eastern side of the entrance channel and a depth of 22 m (70 ft) on the western side. The hard limestone terminates in a series of limestone ridges and channels oriented perpendicular to shore (i.e., spur and groove formations) (see Figure 7E). A sand/rubble bottom continues seaward to deeper depths. The sea floor transitions to a sand bottom about 570 m (1,900 ft) offshore on the eastern side of the channel, and at about 470 m (1,550 ft) seaward on the western side.

3.8.1.4 Protected Species

The protected species of concern known to occur in inshore waters near the project area are humpback whales and spinner dolphins (*Cetacea*), Hawaiian monk seals (*Pinnipedia*) and green sea turtles (*Chelonia*). The endangered Hawksbill sea turtle (*Eretmochelys imbricata*) is much less common than the green sea turtle and none were seen at Kewalo Basin or the offshore waters during the survey.

None of the species observed within the harbor or the inner entrance channel are among those species of marine fishes and invertebrates regulated by the State Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (listed in http://hawaii.gov/dlnr/dar/regulated_fish_names.html).

Green Sea Turtles. The green sea turtle (*Chelonia mydas*) has protected status as a "threatened species" under the U.S. Endangered Species Act of 1978 (ESA), and is the most common protected species in Hawaiian inshore waters. Green sea turtles frequently rest on the sea bottom during the day and feed on algae (or *limu*) inshore of the resting areas during the night. Because green turtles usually select resting sites on or adjacent to hard substratum, the survey attempted to locate resting sites in the nearshore areas to the east and west of the channel entrance. When resting sites are routinely used by turtles, the hard substratum will develop a "worn" or "smoothed" appearance, due to their shells rubbing against the bottom.

The approximate area surveyed for sea turtles totaled approximately 18 acres (7.3 hectares) on the west side of the channel and 32 acres (12.9 hectares) on the east. The survey area extended 185 m (~600 ft) westward from the channel entrance to an abandoned sewer pipe, and seaward to the 22 m (72 ft) depth contour (see Appendix D for specific survey methods and boundaries). On the east side, the survey included an area extending eastward from the channel to the western edge of Ala Moana Beach Park, and approximately 300 m (980 ft) seaward to a point where the sand bottom is encountered.

During the survey, a total of five sea turtles were sighted in the waters offshore of Kewalo Basin, with one turtle located midway through the channel and four located 400 m (1,300 ft) or more offshore of the shoreline fronting Kewalo Basin. The survey also included inspection of the spur and groove formations at the seaward edge of the limestone reef in order to locate possible turtle resting sites (Figure 7E). Although there were numerous undercuts and small caves that could potentially serve as resting sites, no turtles were seen in these areas and no sites with "worn" or smooth substratum (i.e., indicating routine use by turtles) were observed.

The survey found ample algal forage suitable for green turtles present in the waters fronting Kewalo Basin and adjacent to the east on the Ala Moana Beach Park reef flat.

Marine Mammals. The humpback whale (*Megaptera novaeangliae*), listed as endangered under the ESA, is found in Hawaiian waters annually from November through April. None were observed during the survey.

During the survey, a small pod (estimated at 15 individuals) of spinner dolphins (*Stenella longirostris*) were seen more than a kilometer from shore moving towards Waikīkī (to the east). Spinner dolphins rest in sheltered bays along the coast by day and move offshore at dusk to feed on the fishes, squids and other species found in offshore waters. The small pod of spinner porpoises seen here may be part of a much larger group present from Barbers Point on the west to Koko Head on the east.

The endangered Hawaiian monk seal (*Monachus schauinslandi*) has been seen along Oʻahu's south shore and sightings are becoming more commonplace elsewhere around the populated Hawaiian Islands. No monk seals were observed during the field work but with their increased south shore presence, it is conceivable that a seal could pass through and utilize resources in the Kewalo Basin entrance channel during or after the proposed construction.

3.8.1.5 Fishery Resources

This study did not find any fish or shellfish or crustacean species of commercial or recreational interest or any species having a State-protected status either in Kewalo Basin or in the inner entrance channel area. Protected invertebrate species that are sometimes encountered in harbor settings include the black-lipped pearl oyster or *pa* (*Pinctada margaritifera*), introduced oysters (*Crassostrea* spp.), as well as corals. Fish species of commercial and/or recreational interest that are frequently encountered in harbors include the Hawaiian silverside or *'iao* (*Atherinomorus insularum*), juvenile jacks or *papio* (family *Carangidae*), barracuda or *kaku* (*Spyraena barracuda*), mullets or *ama-ama* (*Mugil cephalus*), flagtails or *aholehole* (*Kuhlia sandvicensis*), goatfishes (family *Mullidae*), squirrelfishes or *menpachi* and *ala'ihi* (family *Holocentridae*), surgeonfishes (family *Acanthuridae*), bigeyes or *aweoweo* (family *Priacanthidae*), and to a lesser extent a number of other fish species. However, among the most interesting fishes of commercial or recreational importance entering harbors are those that do so on a seasonal basis; these fishes are generally juveniles that shelter in harbors and bays around the Hawaiian Islands. Included in this group are juvenile bigeye scad or *halalu* (*Selar crumenophthalmus*) and juvenile goatfishes or *'oama* (*Mulloidichthys flavolineatus* and *M. vanicolensis*). *Halalu* are found in harbors and bays from July through December and *'oama* are seen in the spring months (March through May). None of these species were encountered during this survey in Kewalo Basin or inner entrance channel areas.

State law forbids and/or regulates fishing in many harbors and HCDA regulations prohibit fishing within the Kewalo Basin harbor channel from all docks, wharves, and bulkhead walls (see Section 4.8 for discussion). However, in decades past, fishing in harbors was pursued, especially when *halalu* or *akule* (adult) (*Selar crumenophthalmus*) would "run" in Hawai'i's harbors. *Akule* were not encountered in Kewalo Basin during this survey, although a school of unknown size in the seaward part of the entrance channel was observed about 300 m seaward of the inner harbor. These were adult fish (*akule*) and not the juveniles (*halalu*) that usually enter harbors.

The HCDA has an agreement with the KKFC for use of the "Cove" at Kewalo Basin located along the southwestern side of the harbor (see Figure 3). The KKFC is a non-profit organization that uses the Cove and adjacent lands seaward of Honolulu Marine Inc.'s facilities to teach fishing skills, conservation principles, and Hawaiian cultural traditions for the preservation of ocean resources. The Cove receives little vessel use thus fishing there does not conflict with normal operations. As part of its program, the KKFC runs a "tag and release" program for *papio* (family *Carangidae*) and hosts school groups, Boy Scouts, Girl Scouts, and senior citizens wanting to fish. However, underwater observations made in the Cove during the February 2010 survey only noted a few individual fishes of three small species: the toby - *Canthigaster jactator*, the cardinalfish or *'upapalu* (*Foa brachygramma*) and the spotted boxfish or *moa* (*Ostracion meleagris*), none of which are of commercial or recreational interest.

Current conditions indicate that Kewalo Basin is less than desirable as an appropriate habitat for many Hawaiian fish species. In spite of these conditions and the lack of encountering any fish species of commercial or recreational interest within Kewalo Basin during the 2010 marine surveys, it is possible that such species may, on occasion, enter the harbor and entrance channel.

3.8.2 Probable Impacts and Proposed Mitigation

3.8.2.1 Construction Period

Project construction would not cause significant loss of biotic elements. Demolition and removal of existing pilings will remove the sessile (i.e., attached or fixed to substratum) biota on the submerged portions of the piles. If any larger refuse items submerged in the harbor are also removed during construction, sessile biota on those materials would also be removed. However, the affected biota consists of fouling communities dominated by alien species with broad geographic distributions. These communities would likely quickly re-colonize on the new underwater structures included in the proposed action. As described in Section 2.5.3, BMPs will be employed during construction to minimize adverse effects on marine resources.

Construction activities may also result in temporary increases in sediment resuspension and increased turbidity within the water column due to dock demolition, and pile removal and installation. The seaward boundary for the proposed improvements in Kewalo Basin is well inshore of the coral reef communities dominated by native species. This suggests that potential direct impacts due to construction will occur only to a presently highly disturbed benthic community dominated by alien species.

Turbidity barriers will be installed and maintained around the in-water work areas and remain in place until construction activities at that location are completed to minimize sediment transport outside the immediate construction area (i.e., reduce the potential for indirect impacts to coral reef communities outside Kewalo Basin and its entrance channel).

Noise generated during construction could adversely affect protected species. Green sea turtles were not seen in the harbor or entrance channel during the 2010 surveys, but forage and resting areas are within the vicinity of the channel entrance. Whales, dolphins and monk seals are unlikely to be in the harbor or entrance channel. Outside a 54-m radius, calculated sound energy levels created by pile driving in Kewalo Basin were below the NMFS sound energy levels that constitute harassment to protected species (including whales, dolphins, monk seals, and sea turtles) (Goody 2010) (see Section 3.7 for discussion of potential underwater noise impacts). Since all proposed pile driving is well within the harbor and protected species were not seen there in the field survey, construction noise should not be an issue to protected species. Furthermore, a study conducted offshore of West Beach, Oʻahu, found that neither noise nor turbidity generated by use of dynamite and dredging had any negative impact on resident green turtles (Brock 1990 in Brock 2010). Thus, it is reasonable to conclude that the proposed construction activities are unlikely to adversely impact resident green turtles or other protected species.

Although it is unlikely that protected species would be found within the underwater construction noise radii of concern, several types of mitigation could further reduce the potential for adverse impacts due to construction period noise. These include pre-drilling, use of vibratory drivers, pile cushioning, and performing work only during daylight hours to allow visual survey of the affected area for species of concern.

Specific mitigation measures and BMPs to avoid or minimize potential adverse water quality and noise impacts to protected species will be determined in consultation with the appropriate resource and regulatory agencies during the Department of the Army and SMA permitting processes.

3.8.2.2 Operational Period

During the operational period, there will be additional vessel traffic transiting the Kewalo Basin channel due to the addition of 107 slips. However, as noted in Section 3.7.2.2 Underwater Noise, the daily vessel traffic is unlikely to increase significantly due to the expected composition of the tenants. Commercial vessels comprise most of the vessel traffic in and out of the harbor and pleasure craft traffic is very low (once a week or less, per vessel). Most of the future tenant growth is expected in pleasure craft tenants, therefore, the daily increase in vessel traffic is not likely to be significant. Because the future underwater noise and marine traffic environment would not significantly differ from existing conditions, adverse operational period underwater noise impacts to protected species are unlikely.

Although difficult to quantify, future increases in vessel traffic in and out of the harbor could present greater opportunities for collisions with protected species. The increased vessel traffic could also result in increased vessel groundings on the reef on either side of the entrance channel that could adversely impact nearshore biota and habitats due to direct physical damage or indirectly due to petroleum spills or other contaminant releases. However, as discussed in greater detail in Sections 4.1.1.2 and 4.1.2, due to the expected mix of additional vessels (i.e., greater percentage of pleasure craft than commercial vessels), there is unlikely to be a significant increase in daily vessel traffic in and out of the harbor or the numbers of vessels operating in extreme weather conditions (when the risks of groundings increase). Therefore, the project is not expected to significantly increase the risk of vessel groundings or associated adverse impacts to nearshore biota and their habitats.

All vessels operating in State-controlled inland waters (including Māmala Bay) are required to follow "rules of the road," which are comprised of Federal statutory and regulatory rules governing vessel navigation. Standard spill response measures are encouraged and enforced by the Kewalo Basin harbor master (see Section 4.1 for detailed discussion of navigation and Section 3.5 for discussion of spill response protocols).

3.9 Terrestrial Biological Resources

3.9.1 Affected Environment

All terrestrial areas within the project area consist of existing hardened wharf facilities. No terrestrial protected species (flora or fauna) are known to exist in the project area and there is no critical habitat within the project vicinity. Avian and mammalian species typically found in urbanized areas of Honolulu are likely to occur in the project vicinity. They include common mynahs (*Acridotheres tristis*), Spotted dove (*Steptopelia chinensis*), Zebra dove (*Geopelia striata*), House finch (*Carpodacus mexicanus*), English sparrow (*Passer domesticus*), Java sparrows (*Padda oryzivora*), and pigeons (*Columba livia*). Mammalian species common in urban Honolulu include mongoose (*Herpestes auropunctatus)*, rats (*Rattus sp.*), house mouse (*Mus musculus*), domesticated cats (*Felis catus*), and domesticated dogs (*Canis familiaris familiaris*).

The botanical resources in the project vicinity include medians planted with turf and trees along the property's Ala Moana Boulevard frontage and along the Kewalo Basin Park access road and parking areas. Within the Kewalo Basin Park, the landscape comprises large lawn areas shaded by trees and bordered by shrubs. Polynesian-introduced tree species have a strong visual presence in the park, with all species commonly found in coastal designed landscapes. There are a few Native Hawaiian species of trees in the park landscaping, including hala (*Hibiscus tiliaceus*), loulu palm (*Pritchardia sp.*), and areca palm (*Dypsis lutescens*).

There is a community garden in the southwest corner of the peninsula enclosing the harbor that was planted and is maintained by the Hālau Kū Māna public charter school. The approximately 6,000-ft^2 garden contains both native Hawaiian (indigenous and endemic) and introduced species. One endemic species in the garden (*'ohai*) is identified by signage as *Sebsbania tometosa*, which is Federally-listed as endangered, but is also commercially grown by Hui Kū Maoli Ola, a sponsor of the Kewalo Basin Community Garden project.

3.9.2 Probable Impacts

All terrestrial areas within the project area consist of existing hardened wharf facilities. No terrestrial protected species (flora or fauna) are known to exist in the project area. The project's construction and operational activities are limited to the waters, harbor dock infrastructure, and surrounding hardened wharf facilities, and are not expected to impact terrestrial flora or fauna resources surrounding the project area. The project will not displace or otherwise impact the botanical resources in the Kewalo Basin Community Garden.

3.10 Natural Hazards

3.10.1 Affected Environment

According to City and County of Honolulu Department of Emergency Management Evacuation Map 19, the project area is located within a coastal evacuation zone (i.e., for tsunami or storm surge events); the *mauka* boundary of the evacuation zone near Kewalo Basin is Ala Moana Boulevard (http://www.honolulu.gov/dem/maps19.htm accessed March 11, 2010). Evacuation Map 19 includes a note that the maximum rise of water level within Kewalo Basin should not exceed four feet; however, all vessels should be secured, removed, or put out to sea due to the probability of strong currents and wave action. The project area is located within a tsunami evacuation area shown on draft updated City and County of Honolulu maps (Honolulu 2010).

Fastlands adjacent to the harbor are designated within Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (see Figure 8 – Flood Insurance Rate Map). Fastlands to the east, west and south of the harbor are within Zone A (no base flood elevations determined). Fastlands to the north and east of the harbor are in Zone AE (base flood elevation of 4 feet determined).

3.10.2 Probable Impacts

The proposed action is not expected to affect the risks or potential of natural hazard occurrences such as flooding or tsunami, nor increase the severity of these hazards on life or property. The project will not introduce new development on fastlands within the Special Flood Hazard Area and all vessels berthed in the harbor will be subject to the same guidelines and recommendations for being secured, removed or put out to sea prior to storm surge events.

LEGEND

Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance Flood

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations Determined.

ZONE AE Base Flood Elevations Determined.

Source: Panel 365 of 395 Map Number 15003C0365F
Federal Emergency Management Agency, September 30, 2004.

0 Feet 1000
0 Meters 300

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Figure 8

Flood Insurance Rate Map (FIRM)

Hawai'i Community Development Authority

Chapter 4: HUMAN ENVIRONMENT: ENVIRONMENTAL SETTING, PROBABLE IMPACTS AND MITIGATION MEASURES

4.1 Harbor Operations and Navigation

4.1.1 Affected Environment

4.1.1.1 Harbor Operations

Kewalo Basin's current tenants include a mix of commercial fishing, charter tour, pleasure craft, and research vessel operators. Charter tour operators include fishing, parasailing, sailing, passenger cruise, and beach catamarans that operate out of Waikīkī. Since Almar Management assumed management of the harbor in 2009, harbor occupancy has increased from less than 60 vessels to nearly 130 vessels as of March 2010.

Kewalo Basin Rules (HAR Chapter 15-212) establishes priorities for berths and moorings (§15-212-25). Charter or cruise boats have priority in the assignment of Front Row berths. With respect to all other berths, commercial fishing boats have the highest priority, followed by charter or cruise boats. Pleasure craft have the lowest priority in the assignment of berths.

Activities within the harbor generally begin before sunrise, with the departure of charter fishing vessels at about 6:00 a.m. that return either at about noon or 4:00 PM. At about 8:00 a.m., the parasailing operators depart, returning in about one hour and departing shortly thereafter. These operators typically run 10-12 excursions per day. At about 9:00 a.m., the SCUBA diving charters begin departing. These operators run 2-3 excursions per day, each about 3-4 hours long, with the last run returning by about 5:00 p.m. Diving charters also run night dives that generally return by 9:00 p.m. The beach catamarans depart at about 8:00 a.m. and return at sunset.

There is no set schedule for transient fishing boat arrivals or departures. Transient fishing boats are generally assigned a berth at Dock C. Pleasure and private recreational vessels generate much lower volumes of boat traffic into and out of the harbor. The frequency of trips by Kewalo Basin pleasure craft boaters ranges from about once a week to as infrequently as three to four trips per year, per vessel.

As of March 2010, there were 128 vessels with permits to moor in the harbor; about 50% held annual permits and the remaining 50% held 90-day temporary permits (see Table 4).

Table 4
Kewalo Basin Permitted Vessels

Vessel Type	Approx. No.
Commercial fishing (*with annual permit*)	7
Commercial fishing (*transient – 90-day temporary permit*)	25
Charter tour operators • fishing • parasailing • sailing • passenger cruise • beach catamarans	35-40
Research vessels (UH oceanography and film work charter)	2
Recreational vessels	50

Source: Almar Management March 18, 2010.

4.1.1.2 Navigation

The Kewalo Basin harbor and entrance channel are under the jurisdiction of the HCDA. Waters beyond the entrance channel, but within three nautical miles (nm) of the shore, fall under the jurisdiction of the State DLNR. The federal government assumes jurisdiction of waters over three nm from the shoreline seaward to the U.S. Exclusive Economic Zone (200 nm).

At its narrowest point, the harbor entrance channel is about 140 ft wide, which is sufficient to accommodate two boats (ingress and egress) simultaneously. The USCG maintains aids to navigation in the area that are intended to assist vessel operators in fixing their vessel's position and determine a safe course to steer and avoid unseen dangers. There are five lighted buoys that mark the entrance channel. The USCG also maintains a shoreside, tower-mounted range marker situated on the *'ewa* side of Kewalo Basin to guide boat pilots in their approach to the harbor. In June 2009, a second range light tower located adjacent to Ala Moana Boulevard was damaged by an automobile crash and removed from operation. The USCG has a project to upgrade the remaining range light to a system that performs the same guidance function as the pair of range markers, but does not require a second tower/light.

All vessels operating in state-controlled inland waters are required to follow "rules of the road," which are comprised of Federal and State statutory and regulatory rules governing vessel navigation. These rules are published by the USCG as Commandant Instruction (COMDTINST) M16672.2D. In COMDTINST M16672.2D, "inland waters" include Māmala Bay, which extends from Barbers Point to Diamond Head and includes the waters seaward of Kewalo Basin. Title 13 Subtitle 11, Chapter 244, Section 9, HAR prescribes speed restrictions for all vessels operating in State waters. In particular, vessel speeds shall be limited to a slow-no-wake speed so as to create no wake of appreciable wave height, when within two hundred feet of any: shoreline, float, dock, launching ramp, congested beach, swimmer, diver's flag, or anchored, moored or drifting vessel. The statute further requires that "…no person shall operate a vessel at a rate of speed greater than is reasonable having regard to conditions and circumstances such as the closeness of the shore and shore installations, anchored or moored vessels in the vicinity, width of the channel, and if applicable, vessel traffic and water use, or as posted by buoy or sign."

During episodes of high surf, vessel operators can experience difficulty in maneuvering their craft in and out of Kewalo Basin (see Section 3.6.1 for discussion of Wind and Wave Regime).

According to information provided by the USCG for this project, there were two vessel groundings near the entrance to Kewalo Basin between 2000 and June 2010; one in 2000 and one in 2005 (USCG response to Freedom of Information Act Inquiry No. 2010-2664, 2010). Both incidents involved commercial fishing vessels. Other research indicates that three additional fishing vessel groundings occurred on both sides of the Kewalo Basin channel during the same period (one each in 2005, 2008, and 2009) (Waite 2005, USCG May 2008, USCG December 2009). There are a variety of factors that affect the probability of grounding a vessel, including reduced visibility due to inclement weather, nighttime vessel operations, operator experience, and fatigue, vessel maintenance, and others. Anecdotal information from harbor users indicates that groundings near the entrance to the Kewalo Basin channel have been generally infrequent and associated with extreme weather conditions when they have occurred.

4.1.2 Probable Impacts and Proposed Mitigation

4.1.2.1 Construction Period

The construction phasing and methodology will be designed to minimize disruption to existing tenants during the construction period. For example, temporary berths will be provided to accommodate displaced vessels. Dock demolition with be alternated with new dock construction to minimize the decrease in available slips. Some permit-holders may have to be accommodated off-site for a portion or all of the construction period; however, all commercial tenants will be accommodated within Kewalo Basin during the construction period. Construction materials, construction equipment and work barges will be transported via water, and temporary increases in vessel traffic through the channel may be expected.

4.1.2.2 Operational Period

The proposed action includes a 75% increase in the number of tenant slips at Kewalo Basin at full project build out. However, the number of commercial (fishing and excursion) vessels using Kewalo Basin is expected to remain relatively constant even at full buildout. This is because the demand for slips for commercial vessels has remained constant throughout the recent past, as evidenced by the large number of vacancies up until 2009. The increase in occupancy since mid-2009 is attributed to the growth in pleasure craft permits. This trend is expected to continue into the future. This expectation has been corroborated by stakeholder input, because, from a commercial operator's perspective, there is a practical limit to the growth of commercial operations in the harbor. Fishing or commercial boat berths will continue to be given priority over pleasure craft with or without the project.

Increases in harbor traffic may result in an increased risk of vessel groundings. However, the number of vessels transiting the harbor channel is governed by commercial operators who make multiple trips per day, compared to recreational users who generally use their boats much less frequently. As noted earlier in Section 4.1.1.1, pleasure craft trips in and out of the harbor are infrequent, generally ranging from about once a week to once a quarter, per vessel. In comparison, commercial operators make multiple trips throughout the day. Although the future volume of vessel traffic in the channel may increase at peak periods during weekends and holidays compared to the current volumes, the increase is not expected to be proportional to the increase in harbor slips.

As discussed in Section 4.1.1.2, many factors affect the risk of vessel groundings; therefore, there is no direct correlation between the usage rate in a navigation channel and the number of groundings that occur. Because the majority of vessel operators will generally not be in transit during extreme weather conditions, when risks of groundings increase, and because most of the vessel growth is expected to be recreational vessels that generate few trips, the proposed action is not expected to significantly increase the number of vessel groundings. In any case, all mariners will continue to be required to operate according to Federal and State regulations and "rules of the road."

4.2 Roadways, Traffic and Parking

A Traffic Assessment Report was prepared by Julian Ng, Inc. to analyze the potential traffic-related effects of the proposed action, and this report is included in Appendix E. This study analyzed the signalized intersections fronting Kewalo Basin of Ala Moana Boulevard with: 1) Ward Avenue; and 2) Kewalo Basin Access (driveway). An assessment of potential impacts associated with Phase 1 of the project is also included based on SDOT comments. This section also discusses vehicular parking.

Analyses of traffic operations at study intersections were based upon the procedures and methods described in the Highway Capacity Manual (Transportation Research Board 2000). The methods described analyzed the capacity and operating efficiency of signalized intersections. "Level-of-Service" (LOS) is the term used as a qualitative measure of traffic conditions based upon a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. For signalized intersections, LOS "A" and "B" reflect uncongested operations in which all vehicles clear in a single cycle, while LOS "C" through "E" reflect increased levels of congestion, and LOS "F" represents unacceptable or potentially congested traffic operating conditions. LOS "D" typically describes conditions where traffic flow is stable with delays at intersections and congestion along roadway segments, and is generally considered acceptable for peak hour conditions in urban areas.

4.2.1 Affected Environment

4.2.1.1 Area Roadway System

In the project area, Ala Moana Boulevard is the main roadway providing vehicular access to the Kewalo Basin project site along with other uses along the shoreline. Ala Moana Boulevard is a SDOT highway facility designated part of Route 92 that generally runs in an east-west direction between Waikīkī and the H-1 Freeway at the Keʻehi Interchange in Kalihi. State Route 92 is functionally classified as a principal arterial. Ala Moana Boulevard is a six- to eight-lane roadway with a median separating three through lanes of traffic in each direction in the project area. Figure 9 graphically shows the roadway system in this project area.

Existing vehicular access to Kewalo Basin occurs at three roadway connections with Ala Moana Boulevard that are referred to as: 1) Access A; 2) Access B; and 3) Kewalo Basin Access. These three intersections, formed with Ala Moana Boulevard, provide vehicular access to the Kewalo Basin harbor, Kewalo Basin Park, Fisherman's Wharf, other commercial marine and government operations, and several parking lots in this area.

The first access (Access A) is on the western end of Kewalo Basin and located about 100 feet east of the intersection of Ala Moana Boulevard with Ward Avenue. This access is restricted to right-turns for eastbound traffic on Ala Moana Boulevard into the project area. From the westbound left turn lane on Ala Moana Boulevard, motorists access this driveway by making a U-turn at the intersection with Ward Avenue and then turning right into the driveway. The second access (Access B) is located further east of Access A, and restricted to only right-turns for vehicles exiting the project area onto Ala Moana Boulevard.

The third access (Kewalo Basin Access) is located on the eastern end of Kewalo Basin and is a signalized intersection. This intersection allows eastbound vehicles on Ala Moana Boulevard to make right-turns into the area from a shared lane. Vehicles from the project area can also exit onto Ala Moana Boulevard from this intersection making left-turns or right-turns. Separate left-and right-turn storage lanes are provided for northbound vehicles exiting.

Another vehicular access into this project area is available via a driveway connecting to ʻĀhui Street on the western end of Kewalo Basin. ʻĀhui Street is a minor street that is part of the street grid serving the Kakaʻako Makai area. ʻĀhui Street intersects with Ala Moana Boulevard at an unsignalized intersection west of the Ward Avenue intersection. ʻĀhui Street also intersects with Ilalo Street which connects with Ala Moana Boulevard as the northbound leg across the Ward Avenue intersection.

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Figure 9

Existing Roadway System and Parking Areas

Hawai'i Community Development Authority

4.2.1.2 Existing Traffic Conditions

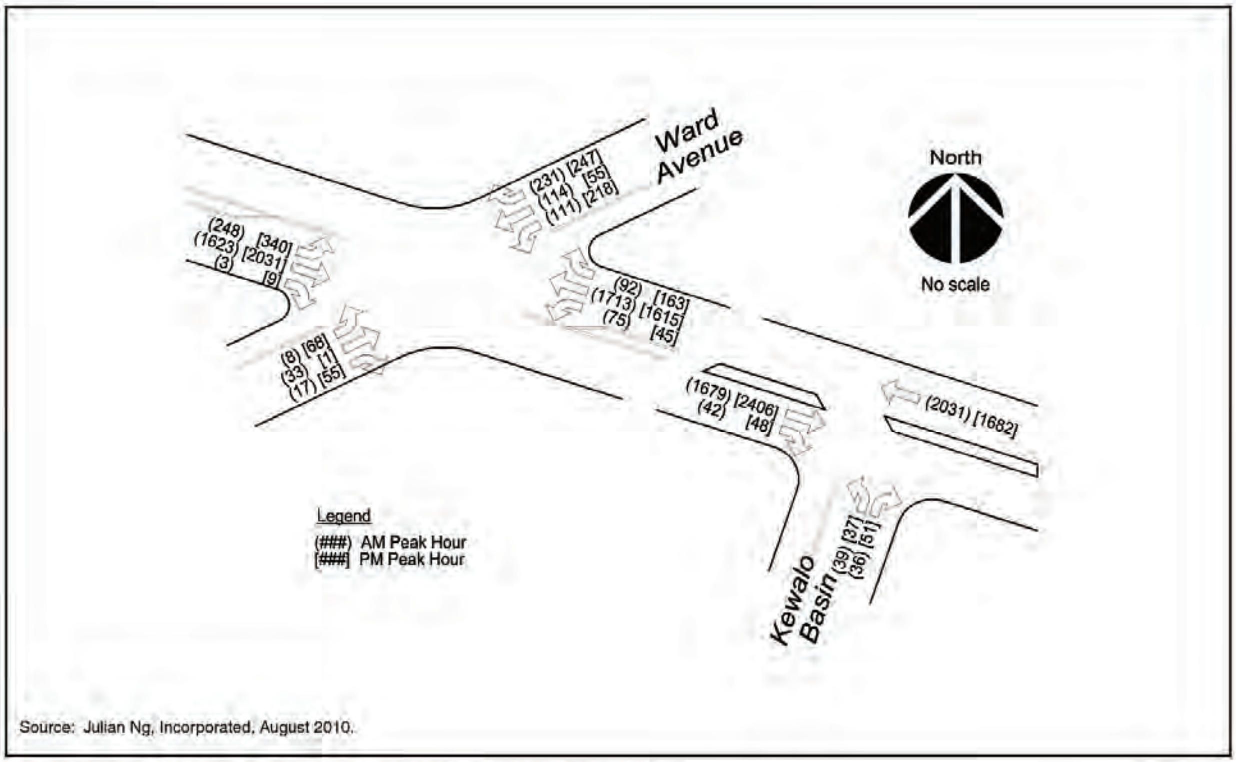
Access A leads to a driveway that provides access to two parking lots situated behind the former Fisherman's Wharf restaurant building. Parking is also provided along the wharf in front of this building and extending makai. About 120 parking stalls are located in this area and are used on a permit basis for employees from the nearby State office building on ʻĀhui Street. This driveway also leads to a parking area and bus/van loading area serving commercial boating operations extending along Ala Moana Boulevard up to the Kewalo Basin Access.

On the eastern side, the Kewalo Basin Access driveway leads to a row of reserved parking stalls along the wharf serving commercial boaters, a public parking lot (payable) of about 72 stalls, and a restricted parking lot next to the sewage treatment facility. The driveway then proceeds to the shoreline to Kewalo Basin Park, which has about 110 public parking stalls.

Peak period manual traffic counts and field observations were taken on two weekdays in February 2010 at the two nearest signalized intersections of Ala Moana Boulevard with Ward Avenue (Access A) and Kewalo Basin Access. Figure 10 graphically shows the 2010 peak hour traffic assignments. The counts included the movement of vehicles parked around Kewalo Basin by people who walked over from nearby office buildings and users of the Kewalo Basin Park. The highest hourly volumes of traffic recorded entering and exiting the Kewalo Basin area during the morning peak hour was between 7:30 to 8:30 a.m. (230 vehicles total) and during the afternoon peak hour it was between 5:15 to 6:15 p.m. (281 vehicles total).

Existing Conditions Level-of-Service. Level-of-service analyses of the two signalized intersections were conducted using the peak hour traffic count data, and the results are summarized in Table 5. The Ala Moana Boulevard with Ward Avenue / Ilalo Street intersection functions at acceptable levels of service for urban areas (LOS D or better) during both morning and afternoon peak hours. The Ala Moana Boulevard with Kewalo Basin Access intersection functions at a good level of service (LOS A) during both peak hours.

At the Ward Avenue intersection, very long delays for both left-turn movements from Ala Moana Boulevard are caused by the combination of the demand actuated phasing and the long signal cycle. This traffic signal operates in six phases, and was observed operating with an average cycle length of 140 seconds during the peak periods. Left-turns in each direction



Kewalo Basin Repairs Project Environmental Impact Statement **Figure 10**

2010 Peak Hour Traffic Assignments

Hawai'i Community Development Authority

from Ala Moana Boulevard (two phases) preceded the opposing through movements (two phases), followed by (two) split phases for Ward Avenue and Ilalo Street traffic. Field observations indicated that the left-turn phases are demand-actuated, as are the cross-street and pedestrian signals for crossing Ala Moana Boulevard. Pedestrian phases for crossing Ala Moana Boulevard are done to avoid conflicts with left-turn traffic.

Very long delays also occur in the high volume westbound through movement because of the signal cycle length and the timing requirements for the side street phases. Long and very long delays occur on the southbound Ward Avenue approach because of the combination of the demand actuated phasing and the long signal cycle. The low vehicular utilization (volume/capacity ratio) and less delay on the northbound approach are the result of the longer green time provided for that phase to satisfy pedestrian crossing requirements instead of vehicles.

Table 5
Existing Levels of Service at Signalized Intersections

Description		Morning Peak Hour			Afternoon Peak Hour		
		Volume/ Capacity Ratio	Average Delay (seconds)	Level-of-Service	Volume/ Capacity Ratio	Average Delay (seconds)	Level-of-Service
Ala Moana Boulevard and Ward Avenue / Ilalo Street	Eastbound Left-Turns	0.90	88.7	F	0.87	72.5	E
	Westbound Left-Turns	0.65	87.4	F	0.40	71.9	E
	Westbound Through	0.80	35.0	D	0.91	48.2	D
	Eastbound Approach	0.60	21.1	C	0.78	26.1	C
	Southbound Approach	0.60	58.1	E	0.68	57.8	E
	Northbound Approach	0.16	60.9	E	0.54	69.6	E
	Overall Intersection	**0.72**	**36.1**	**D**	**0.83**	**41.2**	**D**
Ala Moana Boulevard and Kewalo Basin Access	Eastbound Approach	0.48	5.6	A	0.70	8.2	A
	Northbound Approach	0.19	55.4	E	0.27	56.5	E
	Westbound Through	0.56	6.4	A	0.48	5.6	A
	Overall Intersection	**0.51**	**7.0**	**A**	**0.64**	**8.2**	**A**

Source: Julian Ng, Inc. August 2010.

At the signalized intersection of Ala Moana Boulevard with Kewalo Basin access road, the delays on the northbound approach are similarly very long due to the demand actuated phasing and the long signal cycle. The traffic signal at this intersection operates in two phases. One phase allows traffic on Ala Moana Boulevard to proceed, and the second stops traffic on Ala Moana Boulevard to allow left-turns out from Kewalo Basin. Pedestrian crossing of Ala Moana Boulevard is not permitted at this intersection. This signal also cycled at 140 seconds and appears to be coordinated with the nearby signal at Ala Moana Boulevard and Kamake‘e Street. Additional delays from the multi-phase Kamake‘e Street signal often resulted in eastbound queues backing through the Kewalo Basin intersection.

4.2.1.3 Parking

Approximately 216 parking stalls are available for use by Kewalo Basin users, located in various areas around the harbor, as indicated in Table 6 and shown in Figure 9.

Table 6
Kewalo Basin Harbor Parking Facilities

Parking Area	Location	No.	Notes
A	Fisherman's Wharf loading dock	26	by permit
B	In front of former Fisherman's Wharf restaurant	24	paybox
C	Along Front Row/Ala Moana Boulevard	37	by permit
D	D1 – Diamond Head end of Front Row D2 – Diamond Head end of Front Row (oversized vehicle parking)	15 2	by permit
E	Diamond Head/Ala Moana parking lot	72	paybox
F	Diamond Head wharf	22	paybox
G	Diamond Head side, next to fenced lot	3	reserved
H	H1 - Makai Wharf, Diamond Head end H2 – Makai Wharf, 'Ewa end	11 4	by permit and reserved
	Total	**216**	

Source: HCDA 2010.

HCDA's Rules do not provide specific requirements for the provision of off-street parking. Although field observations indicate that the Kewalo Basin parking areas have low levels of use peak traffic periods, a calculation of theoretical parking demand was calculated using design guidelines for marina design (State of California 2005). According to these design guidelines, 2.0 parking spaces should be provided for a commercial fishing boat berth and 0.6 spaces provided for each recreational berth. Assuming 60% of the existing berths are used for commercial purposes and 40% for pleasure craft (see Table 4 in Section 4.1), this would result in an existing parking requirement of 206 stalls (for 143 berths, 60% = 86 berths and 40% = 57 berths. 86 commercial berths x 2 stalls/berth = 172 stalls. 57 recreational berths x 0.6 stalls/berth = 34 stalls. 172 + 34 = 206 stalls.)

4.2.2 Probable Impacts and Proposed Mitigation

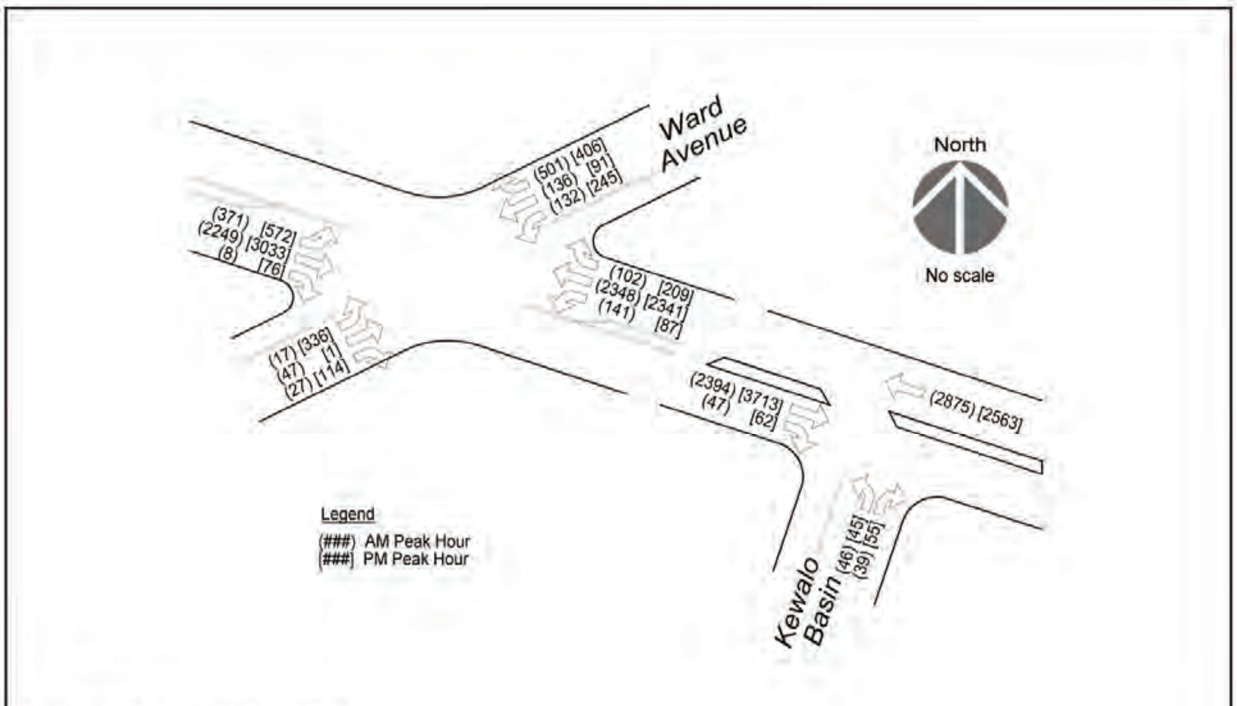
4.2.2.1 Projected Traffic Conditions Without Project (No Action Alternative)

Significant growth in traffic volumes along Ala Moana Boulevard is expected in the future. A traffic study for the *Supplemental Final Environmental Impact Statement for the Kaka'ako Mauka* (EDAW 2009) indicated that peak hour traffic volumes were expected to increase at average rates of between 2.5 and 3.0 percent per year from 2008 to 2030. That traffic report disclosed findings of future over-capacity conditions and poor levels of service at all intersections in the project area. However, it did not provide recommendations for adequate mitigation to address those conditions.

Within the study period, Honolulu will likely see a change in transit services with the implementation of the Honolulu High-Capacity Transit Corridor Project. This service will extend from East Kapolei through downtown Honolulu to Ala Moana Center. Transit service in the project area is expected to be routed along Halekauwila Street, which is situated two blocks north (inland) of Ala Moana Boulevard. A Kaka`ako Station is planned east of Ward Avenue along this route. This station would be situated approximately 1,200 feet away from the study intersection of Ala Moana Boulevard and Ward Avenue.

The transit project will feature a fixed guideway rapid transit and some adjustments in bus service will be implemented as part of the project. While the traffic forecasts from the Kaka`ako Mauka study assumed that the fixed guideway will be in service, the high capacity of the proposed transit improvements will provide additional opportunities to address the projected high vehicular traffic volumes in the area.

Future traffic conditions without the project were projected for the year 2025 by proportionally increasing traffic along Ala Moana Boulevard based upon the traffic projections developed for the Kaka`ako Draft Mauka Area Plan. The resulting projections are shown on Figure 11.



Source: Julian Ng, Incorporated, August 2010.

Kewalo Basin Repairs Project Environmental Impact Statement **Figure 11**

2025 Without Project Peak Hour Traffic Assignments

Hawai'i Community Development Authority

Analyses of these 2025 traffic assignments result in overall utilizations without the project of 1.04 during the morning peak hour and 1.27 during the afternoon peak hour at the intersection of Ala Moana Boulevard and Ward Avenue. The intersection of Ala Moana Boulevard with Kewalo Basin Access had overall utilizations of 0.68 and 0.89 during the morning and afternoon peak hours, respectively.

For utilization greater than 1.1, delay computations would not be meaningful. Therefore, critical movement analysis was used to identify potential traffic impacts. A critical movement sum greater than 1,400 is considered over capacity, and the 2025 afternoon peak hour at the intersection of Ala Moana Boulevard and Ward Avenue was calculated to be 1,688.

4.2.2.2 Projected Traffic Conditions With Project

Project Trip Generation. The proposed project will not change vehicular access patterns into or out of Kewalo Basin, but it will increase the number of slips from 143 to 250 at build-out. The trip generation methodology using the Institute of Transportation Engineers (ITE) published *Trip Generation, 8th Edition* (2008) was used to estimate project generated trips. Trip rate for a "Marina" was used as it is a similar use to the Kewalo Basin Harbor. The Trip Generation manual describes this use as "public or private facilities that provide docks and berths for boats and may include limited retail and restaurant space." The resulting trip generation is shown on Table 7 for Phase 1 of the project in 2012 and at build-out in 2025.

Table 7
Trip Generation Estimate (Marina)

Description	Trip Rates		Phase 1 (21 Slips)		Build-Out (107 Slips)	
	Trip Rate	Percent Entering	Enter	Exit	Enter	Exit
Average Weekday	2.96	50%	30	30	160	160
AM Peak Hour of Adjacent Street	0.08	33%	1	1	3	5
PM Peak Hour of Adjacent Street	0.19	60%	2	2	12	8

Source: Julian Ng, Inc. August 2010

Traffic impacts based upon the ITE Trip Generation trip rates for a marina as shown on Table 7 would be minimal. The highest potential hourly impact is less than 30 vehicles per hour in both directions at full development. This total is considerably less than the ITE's *Transportation Impact Analyses for Site Development* (2005) published criterion for significant impact of 100 vehicles per hour.

Given the minimal trips likely generated by the project using the Trip Generation rates, a second estimate was developed using field count data and observations to develop site-specific trip factors. This effort provides a more conservative (higher) estimate of potential trips generated by the project. Harbor-related parking (216 stalls) is estimated to represent about 45 percent of the total parking stalls available within Kewalo Basin. Based upon field observations, much of the parking designated for harbor use was not occupied, and turnover was low during peak periods. The estimated contribution of harbor-related traffic to peak hour traffic volumes was about 33 percent and reflects a conservatively high range. The resulting trip factors were applied to project trips generated by the project which are shown on Table 8.

Table 8
Trip Generation Based Upon Site Specific Rates

Description	33% of Existing Traffic			Trip Rate per Slip		Phase 1 (21 Slips)		Build-Out (107 Slips)	
	Enter	Exit	Total	Trip Rate	Percent Entering	Enter	Exit	Enter	Exit
AM Peak Hour	36	29	65	0.45	63%	6	4	31	18
PM Peak Hour	51	43	94	0.66	54%	7	6	38	32

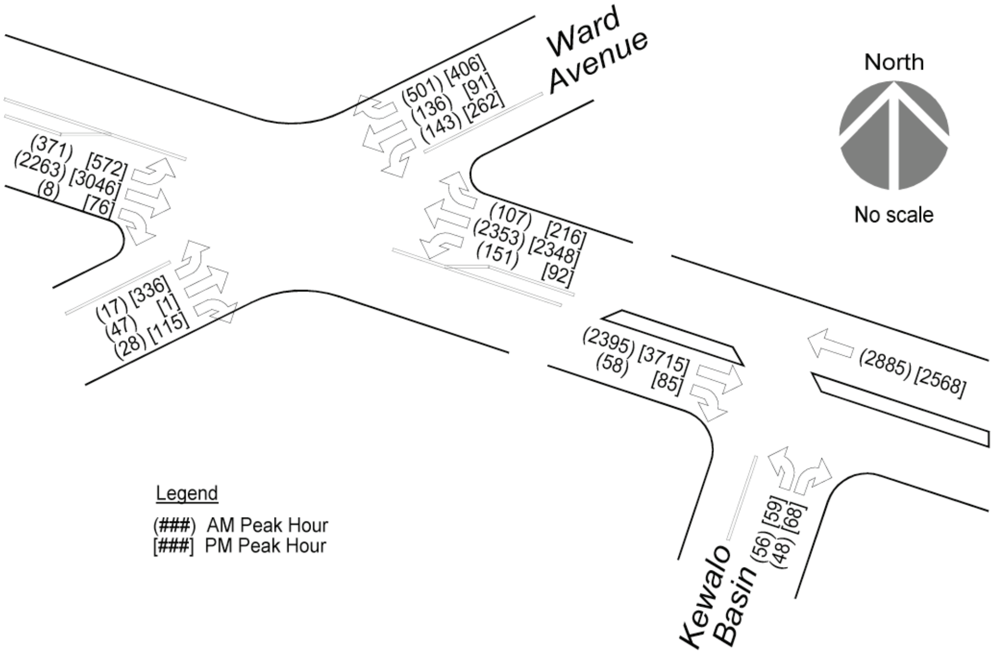
Source: Julian Ng, Inc. August 2010

As shown on the table, the trip generation based upon site data reflects a higher and more conservative estimate of project traffic. Therefore, the probable trips generated from the project will likely be between the higher site data rates and the lower ITE trip rates. The higher traffic estimates were distributed and assigned to the roadway system in proportion to existing traffic. Future peak hour volumes with the project in the year 2025 are shown on Figure 12. Future Phase 1 peak hour volumes in the year 2012 with the project are also shown in Figure 12.

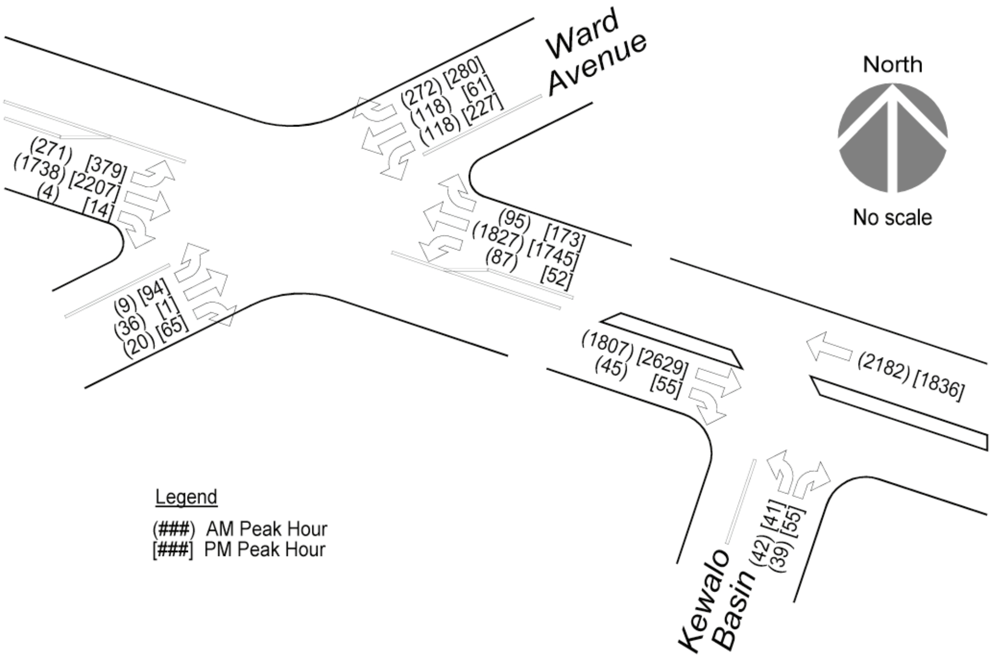
Project Impacts. Table 9 shows the results of the level-of-service analyses for Phase 1. The traffic analyses show acceptable overall levels of service at the nearby study signalized intersections, along with very small changes in volumes and delays when compared to the without project scenario. The additional traffic generated by this phase of the project will not have a significant impact to peak hour traffic conditions. Based upon the acceptable peak hour conditions projected to occur in the year 2012 under Phase 1 of this project, no mitigation measures were warranted.

For the year 2025, build-out of the Kewalo Basin master plan is expected to occur over a number of years. During this time period, traffic conditions will be affected more by traffic generated from other development than by the build out of the Kewalo Basin repairs project. The worst conditions are expected in the afternoon peak hour, where projected volumes would exceed the intersection capacity.

Critical movement sums calculation at the intersection of Ala Moana Boulevard and Ward Avenue was conducted to identify potential impacts of project buildout. This analysis showed that critical movement volumes at the intersection would increase by 1.2 percent, with capacity utilization increasing from 1.12 to 1.13 during the afternoon peak hour due to the project. Table 10 shows the results of the critical movement sums.



2025 With Project Peak Hour Volumes



2012 With Project (Phase 1) Peak Hour Volumes

Source: Julian Ng Incorporated, August 2010.

Figure 12

2025 Build Out and 2012 Phase 1 Traffic Assignments

Hawai‘i Community Development Authority

Table 9
Future 2012 Phase 1 Projected Levels-of-Service at Signalized Intersections

Description		2012 Without Project			2012 With Project		
		Volume/ Capacity Ratio	Average Delay (seconds)	Level-of-Service	Volume/ Capacity Ratio	Average Delay (seconds)	Level-of-Service
MORNING PEAK HOUR							
Ala Moana Boulevard and Ward Avenue / Ilalo Street	Eastbound Left-Turns	0.98	106.5	F	0.98	106.5	F
	Westbound Left-Turns	0.76	99.3	F	0.79	102.7	F
	Westbound Through	0.87	38.7	D	0.87	38.7	D
	Eastbound Approach	0.67	22.6	C	0.67	22.6	C
	Southbound Approach	0.73	61.9	E	0.73	62.1	E
	Northbound Approach	0.19	61.3	E	0.20	61.5	E
	Overall Intersection	**0.78**	**39.9**	**D**	**0.79**	**40.0**	**D**
Ala Moana Boulevard and Kewalo Basin Access	Eastbound Approach	0.52	5.9	A	0.52	5.9	A
	Northbound Approach	0.14	55.5	E	0.20	55.7	E
	Westbound Through	0.61	6.8	A	0.61	6.8	A
	Overall Intersection	**0.54**	**7.3**	**A**	**0.55**	**7.4**	**A**
AFTERNOON PEAK HOUR							
Ala Moana Boulevard and Ward Avenue / Ilalo Street	Eastbound Left-Turns	0.97	90.2	F	0.97	90.2	F
	Westbound Left-Turns	0.45	74.2	E	0.47	75.0	E
	Westbound Through	0.98	58.9	E	0.98	59.0	E
	Eastbound Approach	0.85	29.1	C	0.85	29.1	C
	Southbound Approach	0.72	59.5	E	0.74	60.0	E
	Northbound Approach	0.63	72.8	E	0.64	73.2	E
	Overall Intersection	**0.91**	**47.7**	**D**	**0.91**	**47.9**	**D**
Ala Moana Boulevard and Kewalo Basin Access	Eastbound Approach	0.76	9.5	A	0.76	9.5	A
	Northbound Approach	0.27	56.6	E	0.29	56.9	E
	Westbound Through	0.52	5.9	A	0.52	5.9	A
	Overall Intersection	**0.69**	**9.0**	**A**	**0.69**	**9.1**	**A**

Source: Julian Ng, Inc. August 2010

Table 10
2025 Critical Movement Sums

Description	Morning Peak Hour		Afternoon Peak Hour	
	Without Project	With Project	Without Project	With Project
Ala Moana Blvd. with Ward Avenue	1,479	1,481	1,563	1,582
Ala Moana Blvd. with Kewalo Basin Access Road	1,099	1,246	1,112	1,268

Source: Julian Ng, Inc. August 2010

The resulting effect on traffic volumes from the project should be minor, and the poor levels of service that were projected to occur even without this project due to other developments in the area would not change. The additional traffic generated by the proposed project should not have a significant impact to peak hour traffic conditions. No roadway mitigation measures were recommended for the proposed Kewalo Basin improvements.

The project is not expected to have significant impacts on pedestrians using sidewalks or crosswalks in the Kewalo Basin harbor area. The additional slips are projected to generate a relatively small number of additional vehicles entering and exiting the harbor which would not adversely change existing conditions for pedestrians. Pedestrians would continue to cross streets using established crosswalks during their permitted phasing. Similarly, bicyclists along Ala Moana Boulevard should not be adversely affected by the project due to the small number of additional traffic entering and exiting the harbor.

To minimize potential impacts on the surrounding transportation system during project construction, the construction contractor will notify the Department of Transportation Services, Public Transit Division and O‘ahu Transit Services, Inc. of the scope of work, location, proposed closure of any street, traffic lane, sidewalk, or bus stop and duration of project at least two weeks prior to construction.

4.2.2.3 Parking

At buildout, the project would result in a net increase of 107 berths, or a total of 250 berths. If the same ratio of commercial to pleasure craft is maintained (i.e., 60% commercial, 40% pleasure), this would result in a parking requirement of 360 stalls (60% commercial x 250 berths x 2 stalls/berth = 300 stalls; 40% recreational x 250 berths x 0.6 stalls/berth = 60 stalls; 300 stalls + 60 stalls = 360 stalls). However, this total can be considered a conservative estimate because the total number of commercial vessels berthed at the harbor is expected to stabilize in spite of the increased number of berths that would be available at project buildout. This is due to past occupancy history where the demand for commercial vessel slips remained constant in spite of vacancies in the harbor. Therefore, the proportion of commercial vessels to pleasure craft is likely to shift, with pleasure craft comprising a greater percentage of permitees.

The existing 216 parking stalls allocated to Kewalo Basin use would be insufficient to meet the calculated parking requirement, resulting in a parking deficit of 134 stalls. However, HCDA has long term plans to construct centralized structured parking to serve its Makai Area developments, including Kewalo Basin improvements. The site for this parking structure is located west of the harbor, on an undeveloped parcel bounded by ʻĀhui Street, Ilalo Street and Ohe Street (see Figure 9 for location). This proposal was evaluated as part of a separate HRS 343 Environmental Assessment for the Kakaʻako CDD Makai Area Plan Amendment (Wilson Okamoto Corporation 2005). Because the buildout of the project will take place over time, sufficient parking should be available to accommodate project requirements.

4.3 Infrastructure and Utilities

4.3.1 Affected Environment

Water. Potable water is currently available at all existing docks. The existing docks do not have a dedicated or separate water system for firefighting.

Wastewater. Kewalo Basin provides a sewage collection system at the Makai Wharf for larger commercial fishing vessels that are equipped with onboard sewage pumps. These vessels pump the sewage through the onshore system to an existing sewage lift station near the harbor master's building adjacent to the Makai Wharf for conveyance into the municipal wastewater system for treatment and disposal. However, the facility does not currently offer sewage pumpout services for smaller commercial vessels and recreational vessels without onboard pumps. These vessels discharge onboard wastewater according to USCG regulations (i.e., three miles offshore or at permitted sewage pump-outs at other harbor facilities).

Stormwater Drainage. Kewalo Basin receives stormwater from an approximately 540-acre drainage basin extending from Punchbowl on the *mauka* end. The eastern boundary of the drainage basin runs generally parallel to and east of Pensacola Street. The western boundary of the drainage basin runs generally parallel to and west of Ward Avenue. There are a number of stormwater outlets into Kewalo Basin, ranging from very small (e.g., 2- to 8-in outfalls near the NOAA facility) to large box culvert outfalls (e.g., 4-ft by 3-ft outfall along the Front Row) (AECOM 2009).

Stormwater discharges into Kewalo Basin are covered under an NPDES Notice of General Permit Coverage Authorizing Discharges of Stormwater and Certain Non-Storm Water Discharges from Small Municipal Separate Storm Sewer Systems ("Small MS4") (File No. HI 03KB487). The HCDA prepared a Storm Water Management Program Plan (April 2009) to guide compliance with the Hawaiʻi NPDES program.

Fueling. A dedicated fueling service is not currently available at Kewalo Basin. Present fueling practices involve truck deliveries to the harbor. The fuel trucks generally have a 100-gallon delivery limit, while some of the commercial vessels (e.g., parasail operators) have up to 130-gallon fuel tanks onboard.

4.3.2 Probable Impacts

The project would improve utility services to Kewalo Basin tenants, and is not expected to adversely affect infrastructure and utility systems. Some utility systems serving the boat slips will be upgraded, including electrical, water, and wastewater; however none of the upgrades are expected to detrimentally affect current utility customers or require off-site upgrades to source, generation, transmission, or treatment facilities.

Water. No potable water source upgrades are required to accommodate the proposed action, either for domestic or fire suppression purposes. Potable water service will be provided at the new and replaced docks. Existing connections to the laterals at the bulkhead walls will be used where feasible to minimize onshore modifications. Existing onshore water distribution lines and laterals may need to be extended to provide service to the proposed maintenance dock adjacent to Honolulu Marine if water lines are not available in the vicinity of these new docks.

Because a dedicated water system for firefighting does not currently exist at the Kewalo Basin docks, the proposed action includes fire suppression service to the new docks. The suppression system would be a "wet system" that includes primed distribution fire water lines and fire hose cabinets on the docks. Fire extinguishers will also be provided on the docks and will usually be located within the fire hose cabinets. The principal water supply for the dock-side fire water system will be the onshore potable water distribution system that supplies the docks and local buildings. Tie-ins to the onshore system are needed in order to provide the required flow rate and pressure, as available, to comply with local and state codes and industry standards.

According to the Honolulu Board of Water Supply (BWS), the existing water system is adequate to accommodate the proposed development; however the final decision on the availability of water will be confirmed at the project's building permit stage (see BWS letter dated April 16, 2010 in Chapter 10).

Wastewater. The proposed action will provide sewage pumpout service for smaller vessels that are not accommodated by the existing Kewalo Basin pumpout unit. The discharge from the new pumpout unit is expected to be tied to the existing line to the above mentioned lift station. The additional flow from this service is not expected to require an equipment change at the existing sewer lift station, but the existing capacity of the onshore wastewater transmission will be verified as the design progresses.

Stormwater Drainage. The proposed action will increase the impermeable surfaces at the harbor at buildout due to the additional dock infrastructure proposed. However, the conditions of the applicable NPDES General Permit and management practices in HCDA's Storm Water Management Program Plan that covers stormwater discharges into Kewalo Basin will be complied with to minimize adverse effects of stormwater discharges into the harbor.

Fueling. The proposed fueling dock will provide an alternative to having fuel delivered by trucks for vessels berthed at Kewalo Basin. This practice involves parking the fuel truck as close to the subject vessel as possible, then extending fuel delivery hoses over land to reach the vessel. A dedicated fueling dock would reduce the risk of accidental releases from the fuel truck and portable line. The fuel dock would also allow vessels with larger on-board fuel tanks to take on a full tank of fuel.

4.4 Public Services and Facilities

4.4.1 Affected Environment

Police Protection. The project area falls within the Honolulu Police Department's District 3 (Central Honolulu), Sector 3. Because it falls within its Makai District, the State Department of Public Safety responds to incidents at State facilities, including Kewalo Basin and Kewalo Basin Park.

Fire Protection. The nearest fire station to the project area is the Kaka'ako Fire Station, located about 0.6 miles northwest of Kewalo Basin. As noted in Section 4.3, there is no dedicated water system for firefighting at the Kewalo Basin docks.

4.4.2 Probable Impacts

Police Protection. The project may have an adverse impact on calls for police services during the construction period due to increased levels of noise and traffic. The construction contractor will comply with State DOH permit requirements concerning construction noise, and will coordinate construction activities with the SDOT and City and County of Honolulu Department of Transportation Services regarding any proposed closure of any street, traffic lane, sidewalk, or bus stop.

At project buildout, the intensity of activities at the harbor may increase. However, harbor tenants will continue to be subject to HCDA's rules governing activities at Kewalo Basin, which include compliance with Federal, State and county laws, ordinances, and rules. The State Department of Public Safety will continue its law enforcement role for Kewalo Basin.

Fire Protection. The proposed action would improve fire protection capabilities at the docks through the provision of a dedicated water system capable of supplying the required fire flow for fire suppression. Although the perimeter of the harbor is accessible to fire trucks, the docks are not and will be fitted with fire protection apparatus as part of the proposed action. Civil drawings will be submitted to the Honolulu Fire Department for review and approval as the design process proceeds.

4.5 Socio-Economic Characteristics

4.5.1 Affected Environment

In 2000, the population of the City and County of Honolulu was 876,156 (State of Hawai'i 2008, Table 1.06). The estimated population in 2008 for the City and County of Honolulu was 905,034 (State of Hawai'i DBEDT 2008, Table 1.06). In 2008, there was an average of 1,550 agriculture and 454,150 nonagricultural jobs in the City and County of Honolulu, including 16,150 jobs associated with the Department of Defense (State of Hawai'i DBEDT 2008, Table 12.13).

In its second quarter 2010 summary of its outlook for the economy, the State DBEDT stated that, based on the most recent data and analysis, Hawai'i's economy is expected to continue seeing signs of recovery in 2010 and beyond. Visitor arrivals are expected to increase modestly in 2010, and continue gradual growth into 2011 and 2012 (State of Hawai'i DBEDT May 13, 2010). Modest growth in jobs is expected in the second half of 2010, and projected to increase in 2011.

According to long-term occupational projections for 2008-2018, prepared by the State of Hawai'i Department of Labor and Industrial Relations (State of Hawai'i DBEDT July 2010), statewide employment is projected to grow by 7.1 percent from 2008 to 2018. Personal care and service occupations are expected to experience the fastest job growth (20.4 percent), followed by healthcare support (19 percent), healthcare practitioners and technical occupations (both with 15 percent growth). The State projects small contractions in the legal (-0.6 percent) and architecture/engineering (-0.5 percent) occupations. Construction, installation, maintenance and repair, arts/design/entertainment/sports/media, farming/fishing/forestry, and food preparation and serving occupations are estimated to grow in the 6 to 8 percent range during the same period.

In the long term, the State DBEDT projects the total resident population of the City and County of Honolulu to increase at an annual rate of 0.5 percent from 2007 to 2035. This equates to a 2035 Honolulu resident population of 1.038 million (State of Hawai'i DBEDT 2009). The State DBEDT projects total civilian jobs to increase from 628,900 to 776,500 and personal income to grow at an annual rate of 1.6 percent (in real terms) over the same period.

4.5.2 Probable Impacts

The project will not involve a substantial increase in the overall small boat slip capacity on O'ahu or the State, and it will have negligible effects on the population of the island and the State. The proposed action is likely to have beneficial effects on the State's economy, as it would create construction period jobs and increase long-term opportunities for marine-related commercial operators.

The proposed action is not expected to stimulate an increase in the County's or State's resident or visitor populations, but rather, provide waterfront infrastructure to meet the commercial and recreational demands of a growing population. The project will contribute to short-term, temporary design and construction-related jobs, and will result in a nominal increase in permanent jobs associated with commercial fishing, ocean tours and excursions, and related boating support and ancillary services. Project construction and phasing is being planned to provide interim berthing to the existing Kewalo Basin tenants. Because some commercial tenants may have to relocate to other slips within Kewalo Basin during project construction, they may experience some temporary inconveniences. However, in the long-term, the project will result in superior dock facilities and utility services for existing and future tenants.

4.6 Recreational Resources

4.6.1 Affected Environment

There are a number of land- and ocean-based recreational areas and activities that occur in the immediate vicinity of the Kewalo Basin project site.

4.6.1.1 Land-Based Recreational Areas

Existing land-based recreational areas surrounding Kewalo Basin include the Kaka‘ako Waterfront Park and Kaka‘ako Makai Gateway Park to the west, which together provide over 36 acres of public park space. The Kewalo Basin Park and Ala Moana Regional Park are to the south and east of the harbor, respectively. These recreational areas are identified in Figure 3, and summarized as follows.

Kaka‘ako Waterfront Park. This 30-acre park generally extends along the shoreline from the Kewalo Basin entrance channel westward to the end of Keawe Street. The University of Hawai‘i John A. Burns School of Medicine forms the park's *mauka* boundary. Constructed on a former landfill site, the park consists of a rolling landscape, with a waterfront pedestrian promenade, comfort stations, amphitheater, and observation areas. The park is open between the hours of 6:00 am and 10:00 pm.

Kaka‘ako Makai Gateway Park. This six-acre park is located *mauka* of Kaka‘ako Waterfront Park and provides a view corridor from Ala Moana Boulevard to the Waterfront Park. It consists of a two-acre passive recreation area and a four-acre playing field. The park is open between 6:00 am and 10:00 pm.

Kewalo Basin Park. This five-acre park is located on the peninsula that forms the harbor's southern boundary. It is a public park that includes a waterfront pedestrian promenade, comfort station, shower facilities, observation and picnic areas, and parking.

Vehicular access to this park is through the Kewalo Basin harbor from Ala Moana Boulevard. Current hours of operation are from 5:00 am to 10:00 pm.

Ala Moana Regional Park. Over 70 acres in size, the City's Ala Moana Regional Park (also referred to in this document as Ala Moana Beach Park) is located adjacent to and east of Kewalo Basin (see Figure 3 Project Area and Vicinity). This urban regional park provides a beach area popular for recreation, exercise and socializing. The surrounding reef protects the nearshore waters from strong surf, creating calm water conditions appropriate for swimming, stand-up paddling, and water play. The park includes exercise equipment, tennis courts, gateball field, softball field, lawn bowling, concessions, restrooms, showers, lagoons, designated picnic areas, and parking. It is highly utilized throughout the day by local residents and visitors, and is especially popular for picnics and gatherings on weekends and holidays. At the east end of the park, a peninsula known as "Magic Island" extends seaward. Magic Island (officially "Aina Moana Beach Park"), created from fill material in the 1960s, has a breakwater-protected lagoon at its seaward end.

4.6.1.2 Ocean-Related Recreational Areas

There are a number of ocean-related recreational areas within the project area. Numerous surf breaks are located along the shallow reef that extends east from the Kewalo Basin entrance channel to the eastern end of Ala Moana Beach Park. Additional surf breaks are also located to the west of the entrance channel, fronting the Kaka'ako Waterfront Park. The ocean waters further off-shore are popular for sailing, fishing, diving, canoe paddling, and parasailing, supporting both commercial/charter operations and recreational users.

Kewalo Basin itself provides access to ocean-based recreational activities such as charter and sport fishing, SCUBA diving, parasailing, and a variety of ocean cruises and sailing opportunities. Existing regulations that govern shoreline and ocean recreational activities at this commercial harbor are discussed below to provide background information.

Shoreline and Ocean Recreation Regulations. The Kewalo Basin harbor and associated channel are under the jurisdiction of the HCDA, and regulations governing its use are prescribed under Title 15, Subtitle 4, Chapters 211 to 214, HAR. Waters within three nm of the shore fall under the jurisdiction of the State DLNR, which has established the "South Shore Oahu Ocean Recreation Management Area" regulated under Title 13, Subtitle 11, Chapter 256, HAR. This area includes all ocean waters and navigable streams from Makapu'u Point to the western boundary of the Honolulu International Airport Reef Runway. Therefore, DLNR regulates ocean recreational activities on each side of the Kewalo Basin channel.

Under HCDA regulations, fishing within the harbor channel from all docks, wharves, and bulkhead walls is prohibited (HAR §15-212-121). This includes casting fishing lines into the boat channel along with fishing with nets in the harbor and channel area. The only area within the harbor in which fishing is permitted is the small cove on the west side of the harbor used by the Kewalo Keiki Fishing Conservancy. State regulations prescribed under Title 13, Chapter 232, HAR also prohibit swimming and other associated activities in the harbor and channel, and only authorized persons may enter restricted areas such as channels. As a result, surfers and swimmers crossing navigable channels at small boat harbors, which includes Kewalo Basin's channel, are prohibited.

Surf Breaks. Point Panic is a well known bodysurfing spot located in front of the Kakaʻako Waterfront Park on the western end of the Kewalo Basin channel. This area is restricted to bodysurfing according to State DLNR regulations for this site. Under Title 13, Chapter 254-13, HAR, no person is allowed to operate a surfboard in the restricted area identified as Point Panic ocean waters. This area, which extends 100 yards seaward of the Kewalo Basin seawall between the western end of the harbor channel to ʻĀhui Street (see Figure 13), is primarily reserved for bathing, swimming and bodysurfing, and paipo board riding subject to restrictions. Two bodysurfing meets are allowed at this location each year.

A number of popular board surfing spots are located along the shoreline on either side of the Kewalo Basin channel (see Figure 3). Two surf breaks – Incinerators and Flies – are situated to the west of Point Panic adjacent to Kakaʻako Waterfront Park. Surf breaks located on the eastern side of the channel fronting Kewalo Basin Park include (from the channel moving towards Ala Moana Regional Park) Kewalos (The Point), Rights, Rennicks, Straight Outs and Marine Land. There are a number of other popular surf breaks fronting Ala Moana Regional Park and extending toward Magic Island.

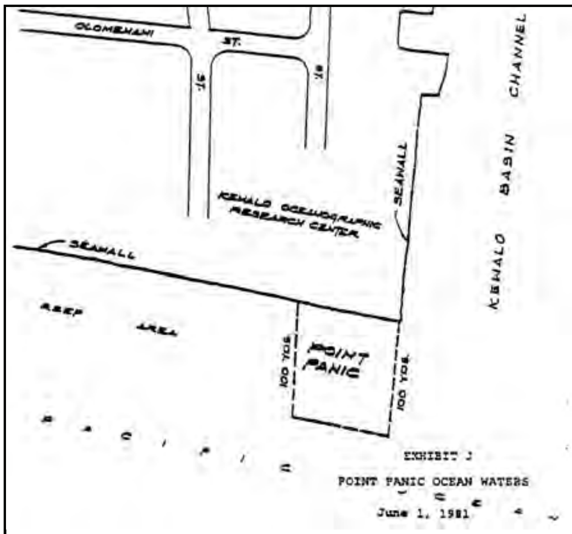


Figure 13: Point Panic Restricted Area
Source: Title 13, Chapter 254-13, HAR

The State DLNR, Division of Boating and Ocean Recreation regulates surf contests held at Kewalo Basin Park, and is authorized to issue eight permits a year for surf contests. Access to the surf breaks for these contests is via Kewalo Basin Park. On the western side of the channel (fronting Kakaʻako Waterfront Park), two sets of steps provide direct access to water: (1) at a small protected cove fronting Kakaʻako Waterfront Park; and (2) at the southeasternmost corner of the park next to the UH-Kewalo Marine Laboratory (nearest Point Panic). On the eastern side of the channel (fronting Kewalo Basin Park), a set of steps at the center of the park provides access to the top of the rocky shoreline wall. In general, surfers and divers accessing the water from this area typically climb along the shoreline wall and enter the water at their preferred location, depending on the wave conditions. Surfers also illegally paddle across the channel to access breaks on the other side.

Recreational Fishing Activities. Recreational fishing in the immediate vicinity of the project area includes both shoreline pole fishing and diving (spearfishing). Shoreline fishing occurs along the breakwater on both sides of the channel, fronting both Kewalo Basin Park and Kaka'ako Waterfront Park.

Under HCDA regulations, fishing and diving in the channel and within the harbor is not permitted, with the exception of fishing activities at the Kewalo Keiki Fishing Conservancy (KKFC) site. HCDA has an agreement with the KKFC for use of the "cove" located along the northwestern side of the inner channel. The KKFC is a 501(c)(3) organization that uses the cove and adjacent facilities to teach fishing skills, conservation principles and Hawaiian cultural traditions for the preservation of ocean resources. As part of its program, the KKFC runs a tag and release program for papio and hosts fishing activities for school and community groups.

Commercial Recreational and Other Activities. The off-shore ocean waters outside of Kewalo Basin and Ala Moana Beach Park support a number of commercial-related recreational activities. The docks at Kewalo Basin are used by several commercial operators that conduct ocean-based recreational activities such as charter and sport fishing, SCUBA diving, parasailing, and a variety of ocean cruises and sailing opportunities. The Front Row of Kewalo Basin is lined with kiosks serving these commercial operators, and a small building along Ala Moana Boulevard is also used by similar operators.

SCUBA diving and snorkeling activities occur at various locations along this coastline both near the shoreline and several hundred yards out. In the immediate area west of the harbor channel is a small cove fronting Kaka'ako Waterfront Park that is used for SCUBA diving and snorkeling. Two other popular dive spots commonly used by commercial operators and recreational divers are situated off shore to the west of the channel. Parasailing activities generally occur farther seaward, away from surfing and diving locations. Other ocean recreational activities include sailing and outrigger canoe paddling, including both competitive racing events and recreational pursuits.

Boating Operations and Conflicts with other Recreational Activities. Boating operations – including mooring at the harbor and transit through the channel – are the primary function of Kewalo Basin. However, the shoreline fronting Kewalo Basin serves a number of competing recreational uses and conflicts between boat operations and other ocean-based recreational activities are a frequent occurrence. In general, the majority of such conflicts are associated with the recreational users' lack of awareness of existing regulations governing the harbor and channel, or unwillingness to comply with the regulations. As discussed in the section on shoreline and ocean recreation regulations, fishing within the harbor and channel from all docks, wharves, and bulkhead walls is prohibited under HCDA regulations. State regulations also prohibit surfers and swimmers from crossing navigable channels (including Kewalo Basin).

Illegal shoreline fishing within the channel occurs from both Kaka'ako Waterfront Park and Kewalo Basin Park. Fishing within the harbor is also common at Fisherman's Wharf. There have been problems with people creating holes in the concrete along the channel wall at Kewalo Basin Park for holding fishing poles. Although these holes are routinely filled, fishermen will routinely create new ones. Illegal diving also occurs alongside the western wall of the harbor channel between John Dominis Restaurant and Point Panic. Although commercial SCUBA diving is not allowed in front of Kaka'ako Waterfront Park without a permit, there have been several incidences of dive companies running unpermitted tours in this area.

Surfing at the designated surf breaks does not conflict with boat traffic using the channel, unless surfers enter the channel. Similarly, shoreline fishing and SCUBA diving activities do not conflict with boat traffic, unless activities are being conducted (illegally) in and alongside the channel. While State rules prohibit surfers, divers, and swimmers from crossing the channel, the harbor master has found it difficult to consistently enforce these rules. It is a common occurrence for surfers to paddle across the channel to access surf spots on the other side of the channel (e.g., from Kaka'ako Waterfront Park and Point Panic to Kewalos and other surf spots on the eastern side of the channel). It is also common for bodysurfers and divers using the steps near Point Panic to swim alongside the western edge of the channel.

To address potential conflicts between boaters and other recreational users that are using or crossing the harbor channel, HCDA and Almar Management have initiated a public awareness program to better educate the public about channel navigation. Specific actions include the following:

1. Install additional signage at Kewalo Basin Park and Kaka'ako Waterfront Park informing the public of regulations governing the harbor and channel.

2. Conduct a public service announcement campaign to inform the public of restrictions associated with this harbor channel.

3. Have staff informally talk to surfers, divers and fishermen and others using the channel to let them know about the dangers of paddling across and fishing in the channel.

4. Work with surf event promoters to better educate surfers about the regulations covering this harbor and channel.

Illegal use of the channel by surfers paddling across the channel, as well as fishermen and divers in the channel, creates dangerous conditions for boat navigation and endangers boat passengers, and surfers and divers that are in the water. Surfers and divers present in the channel may not be visible to boat operators, resulting in potential accidents. Furthermore, surfers and divers in the channel limit the area available for boat navigation, increasing the risk for collisions and vessel groundings.

The narrowest span of the channel is about 140 feet across, and is sufficient to accommodate two boats at the same time (ingress and egress). The presence of divers or surfers in the channel reduces the area available for boat navigation to the extent that a boat entering/exiting the channel may have to slow or stop to let another boat pass. Boats need to maintain a certain level of speed to stay on course while navigating through the channel, and this capability is disrupted if surfers or divers are in the channel. Boats that must slow down or stop at the channel entrance increase the risk of drifting and grounding on the western side of the channel near the popular Point Panic bodysurfing location, due to the ocean current and tradewind directions that typically move in an east-west direction across the channel. Such conditions are further amplified on days with stronger tradewinds and larger waves. Consequently, because of the currents and wind directions, most boat groundings occur on the western side of channel near Point Panic. There have been two incidents in the last three years, with the last occurring in December 2009.

There has been one fatal boating accident near Kewalo Basin involving a boat and another ocean recreation user. In 1984, a 400-person cruise ship trying to maneuver into the channel during high surf conditions lost power in one of its engines and was pushed into Point Panic. While turning around, the ship ran over and killed a bodysurfer at Point Panic.

4.6.2 Probable Impacts and Proposed Mitigation

4.6.2.1 Construction Period

Potential construction period impacts to land-based recreational resources will be limited to the facilities immediately surrounding the project area, and contained away from Kewalo Basin Park to minimize impacts to park users. Typical construction period impacts are expected, such as some additional traffic at Kewalo Basin due to the arrival/departure of construction workers and the transport of construction materials, temporary loss of certain designated parking areas adjacent to the harbor for material storage and construction equipment, and exposure to construction-related noise (see discussion of noise impacts in Section 3.7).

Construction would primarily involve in-water work within the harbor and adverse impacts to ocean-related recreational resources outside the harbor and channel are not expected. Construction activities are not expected to result in substantial or long-term effects to existing water quality. Compliance with applicable Federal and State regulations and implementation of BMPs such as turbidity barriers during construction will minimize the potential for water quality hazards that affect the health and safety of ocean recreational users (see Section 3.5.2 for discussion of water quality). Although temporary increases in vessel traffic through the channel are expected due to the transport of construction materials and equipment, the harbor and channel are restricted areas where recreational activities such as surfing, diving and fishing are not allowed. Increases in vessel traffic will not impact existing recreational activities occurring outside the harbor/channel, as the travel patterns of the construction vessels will be similar to existing boat traffic. Commercial operators that conduct excursions and tours from Kewalo Basin (i.e., charter fishing, parasailing, SCUBA diving, day cruises) may be temporarily interrupted, although construction phasing and methodology will be designed to minimize disruptions (see Section 4.1.2 for discussion of potential construction period impacts).

4.6.2.2 Operational Period

The improvements at Kewalo Basin will provide facilities to support ocean-based recreational activities such as commercial excursions, fishing operations and recreational boating, and will enhance the overall experience for harbor users. Some additional traffic and increased demand for parking in and around the harbor is expected upon full build-out. However, existing parking reserved for harbor operations should be sufficient in the near future. Presently, about 216 parking stalls are reserved for boat harbor operations, and many of these stalls are not utilized throughout the day. In addition, additional parking to accommodate increased harbor operations is planned at another HCDA-owned site near Kewalo Basin. Given the amount of currently-available and planned harbor parking, the existing public parking at Kewalo Basin Park is not expected to be affected by project buildout.

Adverse impacts to the surrounding park facilities are not anticipated since the project: (1) will be limited to the confines of the harbor and its boating facilities; (2) will not physically alter, interfere or restrict access to any parks, ocean shoreline areas or recreational activities; and (3) should have minimal changes to the present demand for land-based recreational resources.

The number of vessels moored in the harbor expected to increase at full buildout. The increase in boats increases the risk for pollutant spills to negatively affect water quality. Compliance with Federal and State boating regulations will minimize this risk of water quality contamination (see Section 3.5.1). Increases in boat traffic entering and exiting the channel may increase the potential for conflicts between boaters and other recreational users within the channel and the harbor. However, the harbor and channel are restricted areas where recreational activities such as surfing, diving and fishing are not allowed. Ongoing programs that promote public awareness, education and enforcement should address existing safety concerns of violators being in restricted areas, as well as reduce the occurrence of violators in restricted areas in the operational period.

Ocean-related recreational resources are located well seaward from Kewalo Basin channel and would not affected by boat traffic, with the exception of the neighboring surf breaks (i.e., Point Panic and Kewalo Point) and the nearby diving areas. These adjacent areas may experience chop from the wake of boats transiting the channel, although the effect will be similar to existing conditions created by current boat traffic through the channel. Boat wake can be considered a short-lived nuisance that quickly dissipates immediately after the boat passes. Compliance with existing harbor rules that require lower transit speeds through the channel will minimize the effects of boat wake.

4.7 Scenic and Visual Resources

4.7.1 Affected Environment

The visual environment in the vicinity of Kewalo Basin is dominated by a highly urban setting to the north and west, made up of office buildings, retail centers, and light industrial uses. Kewalo Basin forms the western end of the open space corridor on the *makai* side of Ala Moana Boulevard that extends from Ward Avenue to the Ala Wai Boat Harbor, and includes Ala Moana Regional Park. Kewalo Basin Park and Kaka'ako Waterfront Park offer public vantage points from which to view the ocean and southern shoreline of O'ahu, including the Waikīkī skyline and Diamond Head.

The City and County of Honolulu's Primary Urban Center Development Plan (PUCDP) defines panoramic views as "broad vistas from distant vantage points." The PUCDP establishes a policy to preserve panoramic views of natural landmarks and the urban skyline by preserving views of the Ko'olau Range, Punchbowl, Diamond Head and other natural landmarks (Policy 3.1.2 in City and County of Honolulu 2002). The PUCDP identifies the panoramic views from Kewalo Basin and the Kaka'ako Waterfront Park toward the Ko'olau Range and Punchbowl as views that should be preserved (Guideline 3.1.3.3 in City and County of Honolulu 2002).

4.7.2 Probable Impacts

The proposed project is not expected to impede significant vistas or panoramic views identified in the PUCDP or existing views of O'ahu's southern coastline from Kewalo Basin Park or Kaka'ako Waterfront Park either during the construction or operational periods. The proposed action will continue the existing uses within the harbor and will not include any structures on fastlands, with the possible exception of fuel storage tanks (which may be placed underground, avoiding visual impacts).

4.8 Archaeological, Cultural and Historic Resources

4.8.1 Affected Environment

4.8.1.1 Archaeological Resources

An archaeological literature review and field inspection (LR/FI) was conducted for the project by Cultural Surveys Hawai'i, Inc., which included historical research to construct a history of land use and determine if archaeological sites have been recorded in or near the area. The findings of the study are summarized in this section; the full report is included as Appendix F. The study was submitted to State Historic Preservation Division (SHPD) for review; SHPD concurred with its findings and recommendations by letter dated June 8, 2010. This correspondence is also included in Appendix F.

The LR/FI did not identify any historic properties within the project area, and none are believed to be present (with the exception of the properties discussed in Section 4.10.1.3 historic resources). The background research associated with the LR/FI indicated that the margins of Kewalo Basin seaward of Ala Moana Boulevard were almost entirely created from land fill actions of the twentieth century (with much of the seaward harbor construction post-dating 1953). The SHPD concurred with the LR/FI finding that there is likely to be no identifiable archaeological resources within the project area.

An addendum to the LR/FI was prepared to address a possible underground fuel storage tank site in the vicinity of the Makai Wharf to support the proposed fuel dock (see Appendix F). Although the specific type of tank and location (above-ground or underground) would be determined at a later design stage, the LR/FI addendum concludes that, because the potential fuel storage site is within fill lands, there should be no adverse impacts to historic properties and no further archaeological work is necessary. The addendum was submitted to SHPD for review, and its concurrence is pending.

4.8.1.2 Cultural Resources

Article XII, Section 7 of the Hawai'i State Constitution (as amended) addresses traditional and customary rights, and states: "The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua'a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights." HRS Chapter 343 requires disclosure of the effects of a proposed action on the cultural practices of the community and State. A cultural impact assessment (CIA) to address the effects that the proposed action may have on cultural resources, practices, and traditions was prepared by Cultural Surveys Hawai'i. This section summarizes the study's findings. The full report is included as Appendix G.

The Kaka'ako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation; however the fill has also contributed to preserving the patterns of early Hawaiian life and the remains of nineteenth century Honolulu. During pre-Contact times, Hawaiians used the lowland marshes, wetlands, salt pans, and coral reef flats of the area for salt-making and farming of fishponds. Land Commission Award documents reveal that much of Kaka'ako lands were used to produce salt. Kaka'ako remained outside the two most intensely populated and cultivated areas on southeastern O'ahu--Waikīkī and Honolulu--during both the pre-Contact (pre-1778) and post-Contact eras. During the post-Contact era (after 1778), Kaka'ako served as a location for undesirable land uses such as a quarantine camp and cemetery for victims of the 1853 smallpox epidemic; hospital for victims of the 1895 cholera epidemic; quarantine camp for patients of 1899 bubonic plague; animal quarantine; and garbage incinerator.

The late nineteenth and early twentieth centuries were a time of intense development of the coasts of Honolulu, Kakaʻako, and Waikīkī, where a number of land reclamation projects dredged offshore areas to deepen and create boat harbors, and the dredged material was used to fill in the former swampy land. Kakaʻako became a prime location for large industrial complexes such as iron works, lumber yards, and draying companies.

Kewalo Basin was a formerly shallow reef that enclosed a deep section of water that had been used as a canoe landing since pre-Contact times. At the end of the nineteenth century, a traditional Japanese sailing vessel—the sampan—was introduced to Hawaiʻi. Over time, the sampan's design was adapted to the rough conditions of Hawaiʻi's waters, and it became associated with a distinctive maritime culture and rise of the commercial fishing industry in Hawaiʻi. The sampan fishermen used a traditional live bait, pole-and-line method of fishing and unloaded their catches of *aku* (bonito, skipjack) and *ahi* (yellow-fin tuna) at Kewalo Basin. The sampan *aku* fleet relocated to Kewalo Basin by 1930, and the Hawaiian Tuna Packers (then "McFarlane Tuna Company") built a new tuna cannery there shortly after. The sampan fishing industry declined dramatically after World War II. One vintage wooden sampan ("Kula Kai") continues to be berthed at Kewalo Basin.

At present, the landscape surrounding Kewalo Basin contains four features that may be considered cultural resources: a statue at the harbor entrance enshrining the *pueo* (owl) as the protector of the Kakaʻako area; an honorific statue of the Blessed Mother Marianne Cope for her historic efforts in battling Hansen's disease; a Native Hawaiian garden associated with the Hālau Kū Māna public charter school (that leases space in the net shed next to Kewalo Basin Park); and the net shed, a structure originally designed for the repair of the aku sampan fishermen's nets.

Cultural and recreational activities such as surfing, paddling, and fishing, occur in the near-shore waters outside Kewalo Basin.

4.8.1.3 Historic Resources

A study was undertaken by Mason Architects, Inc. to determine whether there were any properties with historic significance[1] that would be affected by the project (see Appendix H for full report). The evaluation included the Fisherman's Wharf loading dock; Honolulu Marine shipyard (boat repair) area; Mauka Wharf (Front Row) and accompanying catwalks; Docks A, B, C and D; wharves along Diamond Head side of harbor, and the Makai Wharf (and associated catwalks).

A property must meet at least one of four National Register of Historic Places (NRHP) criteria to qualify as eligible for the NRHP. The four NRHP criteria for historic properties are those:

[1] In this analysis, a property would be deemed to have historic significance if it were considered "eligible" for listing on the National Register of Historic Places.

A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
B. that are associated with the lives of persons significant in our past; or
C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. that have yielded, or may be likely to yield, information important in prehistory or history.

A property must also retain its historic integrity and generally be at least 50 years old in order to be eligible for the NRHP. Integrity ensures that the property conveys its significance through its physical features. The NRHP's seven aspects of integrity are location, design, setting, materials, workmanship, feeling, and association.

At Kewalo Basin, only the Honolulu Marine, Inc. shipyard (boat repair) area was identified as retaining sufficient integrity to be eligible for the NHRP. This site, which includes the wharf, marine railway, shipyard, and shop, was deemed eligible under NRHP criterion "A" for its historic role in the commercial fishing industry as a shipyard for Hawaiian Tuna Packers, Ltd. The remaining properties evaluated (i.e., Fisherman's Wharf loading dock; Mauka Wharf; Docks A, B, C, D and Diamond Head wharf; and Makai Wharf) are either less than 50 years of age, or have undergone extensive repairs and modifications. Because of this, they do not retain sufficient integrity, or exhibit sufficient historic fabric, to convey their significance.

Kewalo Basin has received modifications over time. For example, the entire *makai* side of the basin was a reef that was in-filled in 1955, and the beach connection/adjoining waterway between Kewalo Basin and Ala Moana Beach Park was severed in 1955 when the area was in-filled to form a peninsula. Additionally, the narrow drainage canal from Ala Moana Beach Park to Kewalo Basin was channelized below grade sometime between 1949 and 1953. Because of these modifications, much of Kewalo Basin has lost historic integrity.

4.8.2 Probable Impacts and Proposed Mitigation

4.8.2.1 Archaeological Resources

Because the land around Kewalo Basin was constructed from fill materials, and because the proposed action does not include significant ground disturbing activities within the fastlands, no adverse impacts to archaeological resources are expected. If any cultural or burial sites are identified during ground disturbance--such as during excavation for utility installations--all work will cease and the appropriate agencies will be notified, pursuant to applicable law.

4.8.2.2 Cultural Resources

The CIA concluded that the proposed action will not result in direct impacts on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes. Because the proposed action is limited to the dock assets and associated utilities located adjacent to the docks, it would not impact the four cultural features near the harbor (*pueo* statue, Blessed Mother Marianne Cope statue, Native Hawaiian garden, and net shed). Potential indirect impacts during the construction period include potential water quality impacts to the near-shore marine environment, and consequently to water-based recreational and cultural activities (e.g., surfing), due to in-water construction. These potential impacts will be minimized and mitigated through BMPs employed during the construction period. The operations of the last remaining sampan (Kula Kai) may be adversely affected during the construction period if it does not have access to an adequate berth; however, the project will be phased to ensure that all current tenants are adequately accommodated during the construction period. Community members and Kewalo Basin tenants and stakeholders will continue to be briefed throughout the design and entitlement process.

4.8.2.3 Historic Resources

The project was determined to have no adverse effect on historic properties. The Honolulu Marine, Inc. shipyard (boat repair) area is the only area at Kewalo Basin that was identified as being eligible for the NRHP. The project will require minimal modifications to the NRHP-eligible property. A new maintenance dock would be installed along the length of the shipyard's existing pile and deck wharf and a new jetty constructed on the *mauka* side of the marine railway/haul-out facility. Both new docks would be installed adjacent to, but independent of the Honolulu Marine, Inc.'s facilities. A transition plate would be bolted to either the new dock or the existing wharf to bridge the gap between the structures. Because the proposed modifications to the NRHP-eligible properties are minimal, removable, and in keeping with the historic use and function of the boat repair area, the project would have no adverse effect on historic properties. The historic evaluation and findings were submitted to SHPD, which concurred with this determination. See Appendix H for the historic evaluation and SHPD correspondence.

Chapter 5: RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

5.1 STATE

5.1.1 Hawai‘i State Plan

The Hawai‘i State Plan, embodied in Chapter 226, HRS, serves as a guide for the future long-range development of the State. The State Plan provides a basis for determining priorities, allocating limited resources, and improving coordination of State and County plans, policies, programs, projects, and regulatory activities. The Plan is comprised of three parts: Part I identifies the State's long-range goals, objectives, policies and priorities; Part II establishes a statewide planning system to coordinate and implement the Plan; and Part III establishes priority guidelines to address areas of statewide concern.

The following goals, objectives, policies, and priority guidelines of the Hawai‘i State Plan may be relevant to the proposed action. A discussion of the project's consistency with the applicable State Plan goals, objectives, policies, and priority guidelines is provided in this section.

Section 226-6 Objectives and policies for the economy – in general.
(a)(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawai‘i's people.
(a)(9) Foster greater cooperation and coordination between the government and private sectors in developing Hawai‘i's employment and economic growth opportunities.
(a)(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.
(a)(11) Maintain acceptable working conditions and standards for Hawai‘i's workers.

Discussion: The proposed action is likely to have beneficial effects on the State's economy, as it would create construction period jobs and increase long-term opportunities for marine-related commercial operators. Planned dock and utility improvements will provide modernized berthing and mooring infrastructure and supporting dock-side utilities, and will meet the existing and future demand for commercial and recreation activities, resulting in a nominal increase in permanent jobs associated with commercial fishing, ocean tours and excursions, and related boating support and ancillary services.

Section 226-8 Objective and policies for the economy – visitor industry.
(b)(4) Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.

Section 226-10 Objective and policies for the economy – potential growth activities.
(b)(1) Facilitate investment and employment in economic activities that have the potential for growth such as diversified agriculture, aquaculture, apparel and textile manufacturing, film and television production, and energy and marine-related industries.

Discussion: The proposed action will support the long-term continuation of the project site as a mixed-use harbor, and will provide waterfront facilities that directly support the State's marine-related industries, although it will not involve a substantial increase in the overall small boat slip capacity on O'ahu or the State. Due to its close proximity and convenient access to Waikīkī and Downtown Honolulu, Kewalo Basin is presently an important asset for visitor-related ocean recreational activities. Current tenants that operate tours and activities that appeal to visitors include charter fishing excursions, parasailing, sailing, passenger cruises, SCUBA diving excursions, and several catamarans that operate off of Waikīkī Beach. The planned improvements would address existing waterfront and utility system deficiencies, providing modernized dock-side facilities for harbor tenants and enhancing the overall experience for visitors using the harbor facilities.

Section 226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.
(b)(3) Take into account the physical attributes of areas when planning and designing activities and facilities.
(b)(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai'i.

Discussion: Construction activities will be limited to the confines of the harbor, such that the only upland development includes new connections to existing utility lines and the possible installation of storage tanks for a new fuel dock. The project will involve replacement of existing waterfront facilities, and will not introduce any new land-side structures. Existing geological, topographical or bathymetric conditions at the project area or near vicinity will not be altered. No known rare, threatened or endangered plant and animal species or sensitive natural habitats have been identified within the confines the harbor. Potential adverse impacts to protected marine species (including green sea turtles, humpback whales, dolphins and monk seals) will be minimized and mitigated by compliance with all applicable Federal and State regulations, and specific mitigation measures and BMPs determined during the Department of the Army and SMA permitting processes.

Section 226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources.
(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.
(b)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage.

Discussion: The proposed action is not expected to have a significant adverse impact on any significant vistas or panoramic views identified in the City and County of Honolulu's

PUCDP, or alter any existing views of O'ahu's southern coastline from Kewalo Basin Park or Kaka'ako Waterfront Park. Kewalo Basin has historically been an instrumental part of Honolulu's waterfront, with the initial development of the harbor dating back to the 1920s. The proposed project will support its continued use as a mixed-use harbor, and maintain its functional value to O'ahu's waterfront. An archaeological literature review and field inspection conducted for the project by Cultural Surveys Hawai'i did not identify any historic archaeological resources within the project area. As documented by letter dated June 8, 2010, SHPD concurred with the finding that there is likely to be no identifiable archaeological resources within the project area. Furthermore, the CIA conducted for the project concluded that the proposed action will not result in direct impacts on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes. Dock improvements proposed for the area fronting the Honolulu Marine, Inc. shipyard will require minimal modification to the NRHP-eligible property, which will not result in adverse impacts to historic properties. SHPD concurred with this finding (see Appendix H for correspondence).

Section 226-13 Objectives and policies for the physical environment – land, air, and water quality.
(b)(2) Promote the proper management of Hawai'i's land and water resources.
(b)(3) Promote effective measures to achieve desired quality in Hawai'i's surface, ground, and coastal waters.
(b)(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawai'i's people.

Discussion: The proposed action would not introduce any new major air pollution sources, and the existing ambient air quality at the project area is likely well within Federal and State standards. Construction activities will comply with State provisions to minimize potential impacts to air quality. There are no surface or groundwater resources in the vicinity of the project area that will be affected. There would be potential short term, temporary construction period impacts to marine water quality and the noise environment. A DOH noise permit would be obtained for construction-related noise. Work hours are likely to be restricted to daylight hours. Potential temporary marine water quality impacts would be minimized through the use of construction BMPs; specific mitigation measures will be identified during the Federal and State permitting processes (Section 10 Rivers and Harbors Act and SMA/CDUP).

Section 226-17 Objectives and policies for facility systems – transportation.
(b)(6) Encourage transportation systems that serve to accommodate present and future development needs of communities.
(b)(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives.

Section 226-23 Objective and policies for socio-cultural advancement – leisure.
(b)(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.

Section 226-104 Population growth and land resources priority guidelines.
(3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.
(b)(8) Support the redevelopment of Kaka'ako into a viable residential, industrial, and commercial community.
(b)(13) Protect and enhance Hawai'i's shoreline, open spaces, and scenic resources.

Discussion: The proposed action represents a significant investment by HCDA that demonstrates its commitment to maintaining adequate harbor infrastructure. It provides much-needed upgrades and adds additional slips to address current and future boating needs of O'ahu's growing population. In addition, the proposed action is consistent with HCDA long-term plans for redevelopment of Kaka'ako and ensures continued use of the area for harbor/marine-related activities, including commercial fishing and visitor-industry oriented ocean excursions.

5.1.2 State Functional Plans

The Statewide planning system requires the development of State Functional Plans which are approved by the Governor of Hawai'i. The State Functional Plans guide the implementation of State and County actions in the areas of agriculture, conservation lands, education, energy, health, higher education, historic preservation, housing, recreation, tourism, water resources development, transportation, employment, and human services. The proposed action is consistent with the following objectives, policies and implementing actions of the respective State Functional Plans.

State Transportation Functional Plan

Issue Area II: Economic Development
Objective II.A: Development of a transportation infrastructure that supports economic development initiatives.
Policy II.A.1: Support State economic development initiatives.
Policy II.A.2: Support tourism and economic development.

Discussion: The proposed action improves the harbor infrastructure to accommodate current and future demand for commercial fishing and visitor-oriented excursions and tours in a location close to the visitor hub of Waikīkī. It will also increase dock-side utility services for current and future harbor users.

State Recreation Functional Plan

Issue Area II: Mauka, Urban and Other Recreation Opportunities
Policy II-B(1): Involve the public in the planning, development, and operation of recreational facilities and programs.

Issue Area IV: Resource Conservation and Management
Policy IV-B(1): Enhance water quality to provide high-quality ocean recreation opportunities.

Discussion: HCDA has involved Kewalo Basin stakeholders in the planning process for the proposed repairs project. These stakeholders represent current tenants and representatives of relevant regulatory and resource agencies. Construction period BMPs will minimize potential temporary water quality impacts at the project site. No long-term impacts to marine water quality or marine resources are anticipated.

State Tourism Functional Plan

Issue Area II: Physical Development
Objective II.A: Development and maintenance of well-designed visitor facilities and related developments which are sensitive to the environment, sensitive to neighboring communities and activities, and adequately serviced by infrastructure and support services.
Policy II.A.1: Maintain high standards of overall quality of existing visitor destination and attraction areas.
Policy II.A.2: Enhance tourism product and encourage continued development.

Discussion: The proposed action will enhance and improve visitors' experiences at the harbor by providing modern, upgraded dock infrastructure and utilities to replace aging and inadequate facilities. The project is a continuation of an existing use, and is not expected to have significant adverse effects on neighboring communities and activities, except for temporary noise and traffic impacts during construction periods. Kewalo Basin's proximity to Waikīkī makes it a convenient launching area for visitor-oriented excursions and recreational activities, and improvement and modernization of its dock infrastructure is needed to provide high quality visitor experiences.

State Conservation Lands Functional Plan

Issue Area II: Management
Policy IIA(1)b: Review existing and future uses of public lands and forest reserves.
Implementing Action IIA(1)c: Evaluate applications for use of conservation lands and other uses to prevent adverse impacts on aquatic resources.
Policy IIC(1): Expand marine and fresh water fishing areas and promote fishing opportunities.
Policy IIC(2): Expand and enhance outdoor recreation opportunities and other resource uses.

Discussion: It is assumed that the proposed project will require a CDUP from the State BLNR (pending forthcoming LUC boundary interpretation). The marine resources assessment found that there are no resident protected species in Kewalo Basin, although sea turtles may occasionally enter the harbor waters. The assessment also concluded that the much of the harbor biota consists of fouling communities that are habituated to the existing adverse environmental conditions in the harbor. These fouling communities will quickly recolonize on hard surfaces introduced by the proposed action (i.e., pilings). Construction period BMPs and specific mitigation measures will be determined during the appropriate

Federal and State permitting processes, which will minimize potential adverse impacts on aquatic resources that may result from construction period pile driving and other in-water activities.

5.1.3 State Land Use Law

The State Land Use Law, Chapter 205, HRS, is intended to preserve, protect and encourage the development of lands in the State for uses that are best suited to the public health and welfare of Hawai'i's people. The State Land Use Commission (LUC) classifies all lands in the State into four land use districts: Urban, Agricultural, Conservation, and Rural. HCDA submitted a letter to the LUC on February 9, 2010 to request interpretation of the Urban and Conservation District boundaries pertaining to Kewalo Basin; a response is pending. Determination of the land use classification is currently pending LUC review; however, the project will require a State CDUP from the BLNR if the LUC determines that Kewalo Basin is in the Conservation District. This EIS assumes that the project area is within the State Conservation District.

5.1.4 Hawai'i Coastal Zone Management Program

The National Coastal Zone Management Program was created through passage of the Coastal Zone Management Act of 1972. Hawai'i's Coastal Zone Management (CZM) Program, adopted as Chapter 205A, HRS, provides a basis for protecting, restoring and responsibly developing coastal communities and resources. The objectives and policies of the Hawai'i CZM Program encompass broad concerns such as impact on recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. A discussion of the project's consistency with the objectives and policies of the CZM Program follows.

(1) Recreational Resources

Objective:
Provide coastal recreational opportunities accessible to the public.

Policies:
(A) Improve coordination and funding of coastal recreational planning and management; and
(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:
  (i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
  (ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;
(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;
(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;
(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and
(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, county planning commissions; and crediting such dedication against the requirements of Section 46-6, HRS.

Discussion: The proposed action will allow for continued recreational opportunities accessible to the public by providing improved infrastructure and increasing capacity of the harbor. The project will not adversely impact coastal resources with significant recreational value, as described in Section 4.6 Recreational Resources. Adverse impacts to the surrounding shoreline park or other public recreational facilities are not anticipated since the project: (1) will be limited to the confines of the harbor and its boating facilities; (2) will not physically alter, interfere or restrict access to any parks, ocean shoreline areas or recreational activities; and (3) should have minimal changes to the present demand for land-based recreational resources. Recreational activities such as surfing, diving and fishing are not permitted within Kewalo Basin harbor and channel; therefore, increases in boat traffic in the channel due to the project buildout are not expected to increase conflicts in uses. Chop from additional boat wakes can be considered a short-lived nuisance that quickly dissipates immediately after the boat passes. Compliance with existing harbor rules that require lower transit speeds through the channel will minimize the effects of boat wakes. The project will not change operational period public access to public recreation areas, although some traffic patterns in the immediate vicinity of the construction staging area on the west side of the harbor may be temporarily altered or restricted during the construction period.

There will be potential localized water quality impacts during the construction period as existing dock structures are removed and new pilings are installed. Construction period BMPs such as turbidity curtains will be employed and additional specific mitigation measures will be identified during the Federal and State permitting processes (Section 10 Rivers and Harbors Act permit, SMA permit, and CDUP) to avoid and/or minimize potential water quality impacts.

(2) Historic Resources

Objective:
Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:
(A) Identify and analyze significant archaeological resources;
(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and
(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion: The proposed action will not adversely impact historic or cultural resources (see discussion in Section 4.8). Because the land around Kewalo Basin was constructed from fill materials, and because the proposed action does not include significant ground disturbing activities within the fastlands, no adverse impacts to archaeological resources are expected. If any cultural or burial sites are identified during ground disturbing activities (such as minor excavation for utility installations), all work will cease and the appropriate agencies will be notified, pursuant to applicable law. The proposed modifications to the NRHP-eligible bulkheads fronting Honolulu Marine, Inc.'s facilities will be minimal, removable, and in keeping with the historic use and function of the boat repair area, and thus will have no adverse effect on historic properties (see Appendices F and H for SHPD concurrence).

(3) Scenic and Open Space Resources

Objective:
Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:
(A) Identify valued scenic resources in the coastal zone management area;
(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and
(D) Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion: The proposed action is not expected to impede significant vistas or panoramic views identified in the PUCDP or alter existing views of O'ahu's southern coastline from Kewalo Basin Park or Kaka'ako Waterfront Park. The proposed action will continue the existing uses and visual environment within the harbor, and will not include any structures on fastlands, with the possible exception of fuel storage tanks.

(4) Coastal Ecosystems

Objective:
Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:
(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
(B) Improve the technical basis for natural resource management;
(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: No living stony corals were observed on any of the solid surfaces within Kewalo Basin during the marine surveys conducted for the project. The nearest coral colonies were observed in the outer section of the entrance channel, about 500 ft seaward of the Makai Wharf. Project construction would not cause significant loss of biotic elements due to the degraded marine environment within the harbor. Demolition and removal of existing pilings will remove the sessile (i.e., attached or fixed to substratum) biota on the submerged portions of the piles. If any larger refuse items submerged in the harbor are also removed during construction, sessile biota on those materials would also be removed. However, the affected biota consists of fouling communities dominated by alien species with broad geographic distributions. These communities would likely quickly re-colonize on the new underwater structures included in the proposed action. Construction period water quality BMPs will be employed to minimize the potential for resuspended sediments to travel out of the harbor to coral reef habitats located outside the entrance channel.

(5) Economic Uses

Objective:
Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:
(A) Concentrate coastal dependent development in appropriate areas;
(B) Ensure that coastal dependent developments such as harbors and ports, and coastal related development such as visitor facilities and energy generating facilities, are located, designed, and

constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
  (i) Use of presently designated locations is not feasible;
  (ii) Adverse environmental effects are minimized; and
  (iii) The development is important to the State's economy.

Discussion: The proposed action will allow for continued operations of existing and future commercial and visitor-oriented ocean excursion businesses in Kewalo Basin through the provision of modernized dock infrastructure and utility services. The proposed action is a coastal dependent development that continues the existing harbor use at Kewalo Basin, which has been operational since the 1920s. It is well-located to serve the visitor population and local residents with pleasure craft, and commercial fishing operations. The proposed action does not include physical expansion of the harbor boundaries, but does provide for future population growth by establishing a plan to more efficiently utilize the harbor footprint.

(6) Coastal Hazards

Objective:
Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:
(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;
(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and
(D) Prevent coastal flooding from inland projects.

Discussion: By definition, the proposed action involves work in coastal waters. As described in Section 3.10, the project area is located within a coastal evacuation zone for tsunami and storm surge events. The proposed action will not affect the risks or potential for natural hazard occurrences such as flooding or tsunami, nor increase the severity of these hazards on life or property. The project will not introduce new development on fastlands within the Special Flood Hazard Area and all vessels berthed in the harbor will be subject to the same guidelines and recommendations for being secured, removed or put out to sea prior to storm surge events.

(7) Managing Development

Objective:
Improve the development review process, communication and public participation in the management of coastal resource and hazards.

Policies:
(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;
(B) Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and
(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The project will require Coastal Zone Management Consistency Certification from the State DBEDT OP, which will be addressed as part of the entitlement process. It is assumed that the project will also require a CDUP from the State Board of Land and Natural Resources (pending LUC boundary interpretation); application for this permit will be made after the required SMA Use Permit is obtained for the project.

(8) Public Participation

Objective:
Stimulate public awareness, education, and participation in coastal management.

Policies:
(A) Promote public involvement in coastal zone management processes;
(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and
(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: An EIS Preparation Notice for the proposed action was sent to 25 Federal, State and County agencies, 4 elected officials, and 13 other organizations, including 15 individuals associated with the Kewalo Basin Stakeholder Advisory Group. The Kewalo Basin Stakeholder Advisory Group has also participated in several planning and informational sessions with HCDA and the project designers, and will continue to be involved in the planning and design process.

(9) Beach Protection

Objective:
Protect beaches for public use and recreation.

Policies:
(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;
(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: The proposed action will not alter the certified shoreline in the vicinity of the harbor, as all of the new infrastructure will be located at least 80 ft *mauka* of the shoreline. No erosion-protection structures are being proposed in this project.

(10) Marine Resources

Objective:
Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:
(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;
(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;
(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;
(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and
(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The proposed action will continue the use of Kewalo Basin for economically beneficial uses of marine and coastal resources. Potential adverse impacts from construction to water quality and protected species will be minimized through the employment of BMPs and mitigation measures to be identified in consultation with Federal and State regulatory agencies. Marine, sediment and water quality surveys prepared for this project will contribute to the understanding of marine resources in and around the harbor.

5.2 City and County of Honolulu

Pursuant to Act 153, Session Laws of Hawai'i 1976, HCDA has the overriding authority to supersede the City and County of Honolulu's ordinances and adopted land use policies, including the County's General Plan, development plan and zoning controls. HCDA maintains jurisdiction for land use planning and zoning authority within the Kaka'ako CDD, and regulates development in the Makai Area through the agency's adopted development plan (i.e., the *Kaka'ako Makai Area Plan*) and development rules (HAR Chapter 15-23, Kaka'ako Community Development District Rules for the Makai Area). See Figure 14 for Kaka'ako CDD boundaries.

5.2.1 General Plan

The *General Plan for the City and County of Honolulu* (adopted 1977 and last amended in October 2002), is a statement of the long-range social, economic, environmental, and design objectives for the general welfare and prosperity of the people of O'ahu. The Plan is also a statement of the broad policies that facilitate the attainment of the objectives of the Plan. Eleven (11) subject areas provide the framework for the City's expression of public policy concerning the needs of the people and functions of government. These areas include population; economic activity; the natural environment; housing; transportation and utilities; energy; physical development and urban design; public safety; health and education; culture and recreation; and government operations and fiscal management. The objectives and policies of the *General Plan* that are relevant to the proposed action are as follows, along with a discussion of the project's consistency with these objectives and policies.

<u>*I. Population*</u>
Objective B: To plan for future population growth.
Policy 2: Provide adequate support facilities to accommodate future growth in the number of visitors to O'ahu.

Discussion: The proposed action will provide modernized and expanded dock facilities to accommodate potential future growth in the number of O'ahu residents and visitors who may enjoy ocean-going excursions and activities.

<u>*II. Economic Activity*</u>
Objective A: To promote employment opportunities that will enable all the people of O'ahu to attain a decent standard of living.
Policy 1: Encourage the growth and diversification of O'ahu's economic base.
Policy 2: Encourage the development of small businesses and larger industries which will contribute to the economic and social well-being of O'ahu residents.

Objective D: To make full use of the economic resources of the sea.
Policy 1: Assist the fishing industry to maintain its viability.
Policy 2: Encourage the development of aquaculture, ocean research, and other ocean- related industries.

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Figure 14

Kakaʻako Community Development District / SMA

Hawaiʻi Community Development Authority

Discussion: Commercial fishing and recreational excursion operations will benefit from the proposed action through modernized dock and utility infrastructure at Kewalo Basin. These operations are generally small businesses that offer diverse employment opportunities and utilize the economic resources of the sea.

III. Natural Environment
Objective A: To protect and preserve the natural environment.
Policy 7: Protect the natural environment from damaging levels of air, water, and noise pollution.
Policy 8: Protect plants, birds, and other animals that are unique to the State of Hawai'i and the island of O'ahu.
Policy 10: Increase public awareness and appreciation of O'ahu's land, air, and water resources.
Objective B: To preserve and enhance the natural monuments and scenic views of O'ahu for the benefit of both residents and visitors.
Policy 1: Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands.
Policy 2: Protect O'ahu's scenic views, especially those seen from highly developed and heavily traveled areas.
Policy 4: Provide opportunities for recreational and educational use and physical contact with O'ahu's natural environment.

Discussion: The proposed action will result in potential short-term water quality and noise impacts due to construction activities. These impacts will be temporary and intermittent and be minimized through BMPs and other mitigation measures. A construction noise permit from DOH will be obtained and its conditions complied with. Long-term adverse water quality impacts are unlikely, as Kewalo Basin waters are already exposed to brief episodes of sediment resuspension as vessels enter and exit the harbor. Because the future underwater noise and marine traffic environment would not significantly differ from existing conditions, adverse operational period underwater noise impacts to protected species are unlikely. The project will not adversely affect natural monuments and scenic views of O'ahu, as it will continue the existing uses within the harbor and not include any structures on fastlands, with the possible exception of fuel storage tanks. The project will support opportunities for recreational and educational use and physical contact with O'ahu's natural environment through improving facilities from which residents and visitors may gain access to O'ahu's nearshore waters.

VII. Physical Development and Urban Design
Objective B: To develop Honolulu (Wai'alae-Kāhala to Hālawa), 'Aiea, and Pearl City as the Island's primary urban center.
Policy 8: Foster the development of Honolulu's waterfront as the State's major port and maritime center, as a people-oriented mixed-use area, and as a major recreation area.
Policy 9: Facilitate the redevelopment of Kaka'ako as a major residential, as well as commercial and light-industrial area.

Discussion: The proposed action is consistent with these policies, as it reinforces the existing use of Kewalo Basin for commercial and recreational purposes. It is also consistent with HCDA's long-range plans for the Kaka'ako CDD and reinforces Kewalo Basin's role within Honolulu's waterfront.

VIII. Public Safety
Objective B: To protect the people of O'ahu and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.
Policy 2: Require all developments in areas subject to floods and tsunamis to be located and constructed in a manner that will not create any health or safety hazard.

Discussion: The proposed action will be designed and constructed in compliance with applicable Federal, State and City development standards. The proposed action will not affect the risks or potential for natural hazard occurrences such as flooding or tsunami, nor increase the severity of these hazards on life or property. The project will not introduce new development on fastlands within the Special Flood Hazard Area, with the possible exception of utility structures, and all vessels berthed in the harbor will be subject to the same guidelines and recommendations for being secured, removed or put out to sea prior to storm surge events.

X. Culture and Recreation
Objective B: To protect O'ahu's cultural, historic, architectural, and archaeological resources.
Policy 2: Identify, and to the extent possible, preserve and restore buildings, sites, and areas of social, cultural, historic, architectural, and archaeological significance.
Policy 5: Seek public and private funds, and public participation and support, to protect social, cultural, historic, architectural, and archaeological resources.

Objective D: To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu.
Policy 2: Develop and maintain a system of regional parks and specialized recreation facilities.
Policy 8: Encourage ocean and water-oriented recreation activities that do not adversely impact on the natural environment.
Policy 12: Provide for safe and secure use of public parks, beaches, and recreation facilities.
Policy 13: Encourage the safe use of O'ahu's ocean environments.

Discussion: Because the land around Kewalo Basin was constructed from fill materials, and because the proposed action does not include significant ground disturbing activities within the fastlands, no adverse impacts to archaeological resources are expected. The CIA concluded that the proposed action would not result in direct impacts on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes. The project was determined to have no adverse effect on historic properties; SHPD has concurred with this determination.

The project will continue the existing uses at Kewalo Basin, which include a launching point for water-oriented recreation activities. The proposed action will be limited to the confines of the harbor, its berthing facilities, and utilities serving the docks. It will not physically alter, interfere with, or restrict access to any parks, shoreline areas, or ocean recreational activities.

5.2.2 City and County of Honolulu Primary Urban Center Development Plan

The City and County of Honolulu's Development Plan (DP) program provides a conceptual framework for implementing the objectives and policies of the *General Plan* on an area-wide basis. Eight (8) geographical DP areas have been established on O'ahu, of which community-oriented plans have been established for each area, including the Primary Urban Center DP area where Kewalo Basin is located. The eight (8) community-oriented plans respond to specific conditions and community values of each region, and are intended to help guide public policy, investment, and decision-making over the next 20 years.

The PUCDP was adopted in 2004 and is codified as Ordinance No. 04-14, Revised Ordinances of Honolulu. The Primary Urban Center encompasses O'ahu's most diverse and populous region, extending from Kāhala to Pearl City along O'ahu's southern coastline. The PUCDP's vision statement and implementing policies support retaining the qualities that attract both residents and visitors, while encouraging growth and redevelopment to accommodate the projected increases in jobs and residential population.

This section provides an overview of the vision and guidelines of the PUCDP as it relates to the proposed action. Although conformance with the PUCDP is not required for projects within the Kaka'ako Community Development District, the proposed project is consistent with the following concepts expressed in the PUCDP.

- *Protects and enhances Honolulu's natural, cultural and scenic resources, through the active management and improvement of coastal waters and the enhancement of culturally- and historically-important sites.*

- *Identifies significant panoramic views, including mauka view corridors from the shoreline such as at Kewalo Basin, that should be preserved.*

- *Maintains the PUC as O'ahu's primary employment center and center for many commercial, industrial and transportation-related functions.*

- *Supports attractions that are of interest to both residents and visitors in the Ala Moana/Kaka'ako/Downtown corridor, such as opportunities for State-sponsored waterfront commercial and cultural attractions around the Kewalo Basin area.*

- *Recognizes the recommendation of the* O'ahu Commercial Harbors 2020 Master Plan *for Kewalo Basin to gradually transition to ocean-based tourist activities, and HCDA's role in the development of shoreside land uses.*

The PUCDP Significant Panoramic Views Map (PUCDP Map A:1) identifies the panoramic views from Kewalo Basin and Kewalo Peninsula toward the Koʻolau Range and Punchbowl as significant *mauka-makai* views that should be preserved.

Discussion: The proposed action is limited to improvements within the existing harbor, and is not expected to obstruct or impede significant views identified in the PUCDP or panoramic views from public vantage points at Kewalo Basin.

The PUCDP Land Use Map for the PUC-Central area (Figure 15) illustrates the desired long-range land use pattern for the region. Kewalo Basin is identified with a harbor symbol on the PUC-Central Land Use Map. The proposed action will ensure that this existing use continues.

5.2.3 City and County of Honolulu Land Use Ordinance

The City and County of Honolulu Land Use Ordinance (LUO) regulates land use in accordance with adopted land use policies, including the General Plan and Development Plans. The provisions are also referred to as the Zoning Ordinance. Zoning designations are shown on the zoning maps for the City. Under the current LUO zoning, Kewalo Basin and the surrounding Kakaʻako Makai Area is identified as the "Kakaʻako Community Development District." Development within the Kakaʻako CDD is regulated by HCDA, such that the provisions of the LUO do not apply to properties within the Kakaʻako CDD (HAR Section 15-23-8 (f)).

5.2.4 City and County of Honolulu Special Management Area and Shoreline Setback

The Hawaii Coastal Zone Management Program embodied in Chapter 205A, HRS contains the general objectives and policies upon which all Counties within the State have structured specific legislation creating Special Management Areas (SMA). Any development within the SMA requires an SMA Use Permit. SMA Use permits on Oʻahu are typically administered by the City and County of Honolulu Department of Planning and Permitting pursuant to Chapter 25, Revised Ordinances of Honolulu, as amended, with the exception of the designated CDDs (Kakaʻako and Kalaeloa) which are administered by the State of Hawaiʻi OP.

In accordance with Section 206E-5, HRS, OP has the administrative authority to process SMA and Shoreline Setback reviews for development within the designated CDDs. Any activity within the SMA boundary that meets the definition of "development" in these designated areas requires coordination and/or approval from the OP, CZM Program (HAR Chapter 15-150). The proposed project is located within the boundaries of the SMA (see Figure 14), and will require a SMA Use Permit from the State DBEDT OP. All phases of the proposed project will be in accordance with the rules and regulations of the SMA. A discussion of the project's consistency with the objectives and policies of the CZM Program is presented in Section 5.1.4.

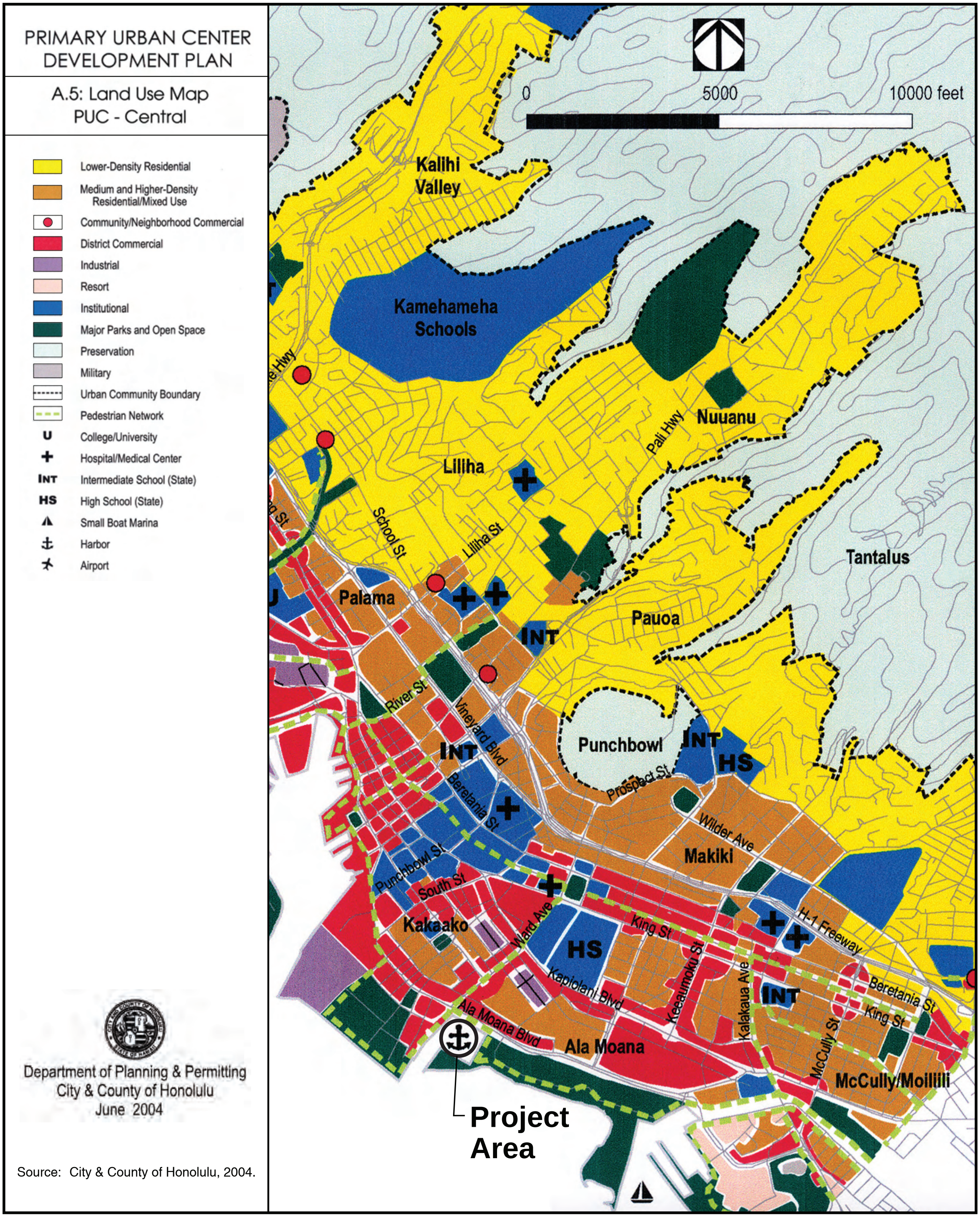

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Figure 15

PUC Development Plan Central Land Use Map

Hawai‘i Community Development Authority

OP is also responsible for administering the State's Shoreline Setback law within the designated CDDs. The shoreline setback area is defined as the land area located 40 feet inland of the certified shoreline. Any development or related activity (including the removal of sand, rocks and soil) is prohibited within the shoreline setback area. The proposed action will be confined to the inner harbor (i.e., more than 40 ft inland of the certified shoreline), and will not involve any development or related activities within the shoreline setback area.

5.3 Other

5.3.1 O‘ahu Commercial Harbors 2020 Master Plan

The *O‘ahu Commercial Harbors 2020 Master Plan* (1997) is the State of Hawai‘i Department of Transportation's long-range guide for the development and maintenance of safe, efficient and economically viable harbor facilities at O‘ahu's commercial ports. The Plan addresses O‘ahu's harbors – including Honolulu, Kewalo Basin and Kalaeloa Barbers Point harbors – as dependent harbors, whose activities are closely entwined. Recommendations for Kewalo Basin presented in the 2020 Master Plan include a gradual transition to ocean-based tourist activities following the consolidation of commercial fishing operations to Honolulu Harbor (i.e., new fishing village at Pier 36-38) and Ke‘ehi Lagoon. Navigation improvements (i.e., jetties and channel dredging) addressing issues of cross currents, eddies and high surf at the Kewalo Basin channel entrance that affect vessel maneuverability and harbor access are also recommended.

Discussion: Although the proposed action is consistent with the *2020 Master Plan*'s recommendation to transition to ocean-based tourist activities (since it does not impede this transition), the existing priority of berth assignments would be maintained. Charter or cruise boats have priority in the assignment of Front Row berths. With respect to all other berths, commercial fishing boats have the highest priority, followed by charter or cruise boats. Pleasure craft have the lowest priority in the assignment of berths.

This project does not address the 2020 Master Plan's recommendation for navigation improvements; if HCDA proposes to pursue such improvements, they would be carried out as unrelated actions.

5.3.2 Kaka‘ako Makai Area Plan

The Hawai‘i State Legislature created the HCDA in 1976 to plan for and guide the timely revitalization of underdeveloped communities in the State, and designated the Kaka‘ako area as the Authority's first CDD. Operating under legislative mandate, HCDA is responsible for conducting comprehensive planning, administering land use and zoning regulations, and directly promoting economic development in designated community development districts, including the Kaka‘ako and Kalaeloa CDDs.

In 1982, following an intensive five-year planning process, HCDA adopted the *Kaka'ako Community Development District Plan* to serve as the basis for public and private development in Kaka'ako. The development plan was subsequently amended to include the Kaka'ako waterfront area, and is currently comprised of two documents that set forth the development objectives and rationale for the future redevelopment of the area: the *Kaka'ako Mauka Area Plan* covering the area *mauka* of Ala Moana Boulevard) and the *Kaka'ako Makai Area Plan* (covering the lands *makai* of Ala Moana Boulevard). As originally established in 1982, the Makai Area included approximately 133 acres between Kewalo Basin and Pier 4. The boundaries of the Makai Area, and the content of the *Makai Area Plan*, have been modified over the years. In 1987, the State Legislature modified the Makai Area boundaries to include all lands *makai* of Ala Moana Boulevard from Ala Moana Park to Aloha Tower, expanding the Makai Area from 133 acres to 227 acres. In 1990, the acreage of the Makai Area was reduced to 221 acres when waterfront property adjacent to Aloha Tower was reassigned to the Aloha Tower Development Corporation (Note: HCDA retained jurisdiction of the Hawaiian Electric Company (HECO) property *makai* of Nimitz Highway). The Makai Area boundary was most recently revised in 2006. The current boundaries encompass 220 acres, spanning the land area from Kewalo Basin and Honolulu Harbor *makai* of Ala Moana Boulevard, and the HECO property in the vicinity of Aloha Tower/Pier 6 (see Figure 14 for current boundaries of the Kaka'ako CDD Makai Area).

The *Kaka'ako Makai Area Plan* (2005) sets forth the overall vision for the Makai Area: "to create an active, vibrant area through a variety of new developments, including an expansive waterfront park, maritime uses along the harbor, restaurants, markets and entertainment along Kewalo Basin, a children's museum, educational and research facilities, residential and commercial developments" (HCDA 2005, 22). In addition to the future development of residential, commercial and recreational amenities, the Plan assumes the continued use of the active waterfront. The *Makai Area Plan* supports maritime activities along Honolulu's waterfront, specifying that Kewalo Basin has been "set aside for the public to view and enjoy the working wharf aspect of the waterfront" (HCDA 2005, 23). According to the Plan, Kewalo Basin should continue to support fishing and tourist-related boating activities, although existing fishing services along the west edge of the harbor should be relocated to minimize potential conflicts with future entertainment, restaurants, residential and retail uses planned adjacent to the harbor.

HCDA is currently working with the Kaka'ako Makai Community Planning Advisory Council (CPAC) and other stakeholders to update the *Kaka'ako Makai Area Plan*. The planning process is expected to be completed by December 2010.

5.3.3 Kaka'ako Makai Community Planning Advisory Council Vision and Guiding Principles

The Kaka'ako Makai CPAC was convened in 2007 as an advisory group to work with HCDA and "meaningfully participate in the development, acceptance, and implementation of any future plans for the development of Kaka'ako Makai" (House Concurrent Resolution

30, 2006). The Vision Statement and Guiding Principles developed by and adopted by the CPAC puts forth the desired future for Kakaʻako's waterfront lands. A discussion of the proposed action's consistency with the CPAC's future vision and guiding principles for the Kakaʻako Makai area follows.

The **Vision for Kakaʻako Makai** recognizes the Makai Area as the community's gathering place:

"Kakaʻako Makai is the community's gathering place. A safe place that welcomes all people, from keiki to kūpuna, with enriching cultural, recreational and educational public uses. A special place that continues the shoreline lei of green with scenic beauty, connects panoramic vistas mauka to makai, and encourages ecological integrity of land, air and sea. Kakaʻako Makai honors, celebrates and preserves its historic sense of place, Hawaiian cultural values and our unique island lifestyle for present families and future generations."

Discussion: The proposed action is consistent with the Vision for Kakaʻako Makai by supporting Kewalo Basin's continued function as an important commercial and pleasure craft harbor through significant investment in its recapitalization and modernization.

The **Guiding Principles** establish guidance for social, economic, cultural and environmental conditions that should be considered when planning for the area. The Guiding Principles address 14 specific topic areas, including coastal and marine resources, expanded park and green space, public accessibility, and uses at Kewalo Basin. The guiding principles for the Kakaʻako Makai Area that are applicable to the proposed action are listed as follows:

Community Gathering Place
Establish Kakaʻako Makai as a gathering place where community and culture converge in response to the natural scenic beauty of the green shoreline open space.

(2) Provide enriching public recreational, cultural and educational opportunities for residents and visitors alike through Kakaʻako Makai's scenic coastal and marine environment, the Native Hawaiian cultural heritage, compatible facilities and activities, and historic sites and settings.

Hawaiian Culture and Values of the Ahupuaʻa
Base the framework for planning, decision-making and implementation of the Kakaʻako Makai master plan on Native Hawaiian values and traditional and customary rights and practices protected by the State.

(2) Incorporate the ahupuaʻa concept and spirit of caring for, conserving and preserving the self-sustaining resource systems necessary for life, including the land that provides sustenance and shelter, the natural elements of air, wind and rain extending beyond the mountain peaks and streams of pure water, and the ocean from the shoreline to beyond the reef where fish are caught.

(4) Assure that the planning of collective or individual traditional features, settings, and activities will be overseen by Hawaiian historic and cultural experts to prevent misinterpretation or exploitation.

Open View Planes
Protect, preserve and perpetuate Kaka'ako Makai's open view planes from the mountains to the sea as an inherent value of the Hawaiian ahupua'a and an important public asset for residents, visitors and future generations.

(1) Ensure planning and development safeguards to identify, document, retain, restore and protect Makai-Mauka and Diamond Head-'Ewa open view planes to the Ko'olau mountains, Diamond Head (Leahi) and the Wai'anae Mountains as seen from the view vantage areas and vicinities of Kaka'ako Makai's public lands and Kewalo Basin Harbor.

Coastal and Marine Resources
Preserve, restore and maintain Kaka'ako Makai's valuable coastal and marine resources for present and future generations.

(1) Enable the monitoring, protection, restoration, and conservation of natural coastal and ocean resources, including reef and marine life, through responsible stewardship and sustainable practices.

(2) Protect and sustain the coastal environment for cultural uses including fishing, ocean gathering, surfing and ocean navigation.

Expanded Park and Green Space
(1) Implement the Hawaiian values of the ahupua'a and malama 'aina by preserving shoreline open space, protecting scenic coastal and marine resources, and respecting the natural interaction of people, land, ocean and air.

Public Safety, Health and Welfare
Ensure that Kaka'ako Makai is a safe and secure place for residents and visitors.

(1) Keep public use areas safe day and night for public comfort and enjoyment.

(2) Ensure that exposure to land and ocean is environmentally safe for people and marine life by assuring timely investigation, determination, and remediation of contaminates.

(3) Ensure that Kaka'ako Makai remains free and clear of elements, activities and facilities that may be potentially harmful to the natural environment and public well-being, including laboratories containing and experimenting with Level 3 or higher bio-hazardous pathogens and/or biological toxins known to have the potential to pose a severe threat to public health and safety.

Public Land Use Legislation – Public Use of Public Lands in the Public Interest
Recognize and respect the effort and intent of the Hawaii State Legislature to uphold the greater public interest by ensuring and sustaining public uses on Kaka'ako Makai State public lands for the greater public good.

(2) Demonstrate commitment to serve the highest needs and aspirations of Hawaii's people and the long-term good of Hawaii's residents and future generations through community-based planning.

(3) Restore the site-dependent use of Kewalo Basin Cove to the Kewalo Keiki Fishing Conservancy.

<u>Kewalo Basin</u>
Ensure that Kewalo Basin Harbor's unique identity is retained with continued small commercial fishing and excursion boat uses, keiki fishing and marine conservation, marine research and education, and accessible green park open space expanding the lei of green between Ala Moana Park and Kaka'ako Waterfront Park.

(1) Enable continued functional commercial boating uses at Kewalo Basin Harbor and preserve the beneficial relationships between the existing small commercial fishing and excursion boat businesses and land-based maritime support service businesses.

(2) Ensure that Kewalo Basin will continue as a State of Hawaii commercial harbor and valuable public facility asset by repairing, maintaining and enhancing the harbor for small commercial fishing and excursion boat use.

(3) Ensure the protected use of Kewalo Basin Cove for the Kewalo Keiki Fishing Conservancy keiki fishing and marine conservation programs.

<u>Site Design Guidelines: A Hawaiian Sense of Place in Landscape, Setting and Design</u>
Ensure that Kaka'ako Makai's public use facilities are compatible in placement, architectural form, and functional design within the landscape of the shoreline gathering place.

(1) Identify, protect, preserve, restore, rehabilitate, interpret and celebrate Kaka'ako Makai's historic sites, facilities, settings, and locations.

(2) Maintain the quality of coastal environmental elements including natural light, air and prevailing winds.

(3) Mandate sustainability principles, conservation technologies, and green building standards for buildings, grounds and infrastructure.

<u>Community/Government Planning Partnership</u>
The Kaka'ako Makai CPAC places the public interest first and foremost, and will strive to uphold the greater good of the community in partnership with the HCDA as the public oversight agency by:

(1) Openly working with the community, the HCDA and the HCDA's planning consultants as guaranteed by government commitment to ongoing community representation and involvement throughout the master planning process.

Discussion: The proposed action supports Kaka'ako Makai's role as a gathering place by ensuring that Kewalo Basin remain a hub for commercial and recreational ocean-going activities. The CIA for the project concluded that the proposed action would not result in direct impacts on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes, and also contributes to the base of knowledge about the cultural history of the area. The proposed action would not impede open view planes from the mountains to the sea or Diamond Head-'Ewa view planes. Marine assessments concluded that the proposed action would not significantly affect the coastal environment and its use for fishing, gathering, surfing and navigation. Best management practices and adherence to HCDA's existing Storm Water Management Program Plan for Kewalo Basin Harbor during the operational period will minimize the release of hazardous or regulated materials into the environment from activities at Kewalo Basin.

The proposed action addresses existing facility deficiencies and infrastructure and facility upgrades for harbor users, including small commercial fishing and commercial operations. It demonstrates a significant investment by HCDA to maintain and enhance the harbor, and recognizes Kewalo Basin's long-standing function as a valuable public waterfront asset. The project would not affect the current prioritization of berth assignments. The project would not impact the use of Kewalo Basin Cove by the KKFC. The project would not adversely affect historic properties, such as the bulkheads associated with Honolulu Marine, Inc.'s shipyard. Project planning and design have been conducted in consultation with the Kewalo Basin Stakeholder Advisory Group.

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Chapter 6: ALTERNATIVES CONSIDERED

This section has been prepared following guidance provided by HAR §11-200-17 (F).

In addition to the Proposed Action, several alternatives were considered and evaluated for their feasibility and their ability to meet project objectives:

- No Action Alternative (i.e., status quo)
- Repair Existing Docks
- In-Kind Replacement
- Alternative Layout
- Other Alternatives

6.1 No Action Alternative

The No Action Alternative assumes that the harbor would continue to be utilized in its present arrangement and condition. Under this alternative, no capital expenditures would be made to carry out any long-term recapitalization of the aging and deteriorating structures within the harbor. Based on its current state of disrepair, this alternative is not considered a feasible approach since it does not safeguard the users of the harbor facilities (tenants and customers), preserve the capital investment within the harbor, or realize the project benefits. Most importantly, the No Action alternative would not meet the project purpose and objectives and thus cannot be considered a "reasonable" alternative.

6.2 Patch Repair Existing Dock Structures

This alternative involves localized repairs to mitigate known structural deficiencies and ongoing deterioration in order to extend the service life of the existing assets.

The existing docks are primarily of concrete construction and most of the observed damage is characterized by corrosion due to salt water ingress within cracks in the concrete. As a result of the salt water infiltration, there is corrosion of the reinforcing steel members, as well spalling of the concrete cover. If left alone, the rate and extent of corrosion damage will accelerate over time, increasing the amount of damage and possibly leading to localized and/or global failure of the structures and their components.

Structural patch repairs of corrosion-damaged concrete generally involves the removal of damaged concrete to expose the corroding reinforcing steel bars, cleaning the exposed steel and concrete substrate using sand or hydro-blasting techniques, and casting new concrete to reinstate the section to its original dimensions. In some instances, additional steel reinforcing may be required.

While patch repairs are often a common, effective and affordable means of addressing limited and localized corrosion deterioration in concrete structures, other factors, such as the expected service life of the repair and/or the structure, must be considered when determining between repair and replacement. Where extensive corrosion deterioration is evident, widespread patch repairs are generally not feasible when considering the life-cycle of the repaired structure. In the case of the Kewalo Basin docks, it should be noted that most, if not all, of the harbor structures have already undergone various forms of retrofit and patch repairs during their current service lives. As an example, although Dock C was constructed in 1986 and underwent an extensive retrofit program in 1998, recent observations indicate present corrosion damage only 13 years after its retrofit.

A heavy investment of capital to address short-term repairs limits the opportunities to invest into revitalization and modernization of the aging harbor structures. As evidenced by the recurring corrosion damage to the dock decks within a relatively short time after repair, this alternative does not meet the project objective of providing modernized berthing infrastructure to meet long-term needs. Accordingly, the "patch repair of existing dock structures" alternative is not considered a "reasonable alternative."

6.3 In-Kind Replacement

The In-Kind Replacement alternative would demolish the existing docks and replace them in their present layout. This would involve removal and replacement of only the above-water components (e.g., longitudinal beams and deck panels). This would not achieve the project objectives of optimizing the capacity of the slips in the harbor. It would also not allow for incorporating new engineering solutions and technology to address the damaging effects of wind and storm-generated waves in the harbor. Therefore, this alternative is not considered a "reasonable" alternative.

6.4 Alternate Layouts

HCDA also considered a number of alternate configurations of the harbor's dock infrastructure. These alternate layouts were presented to the Kewalo Basin Stakeholder Advisory Group, which provided input and suggestions. The Kewalo Advisory Group identified potential variations of the harbor design, which would result in slightly different total slips and lineal feet of berthing than the proposed action. These alternate layout alternatives are discussed below.

6.4.1 Makai Wharf Finger Docks

In this alternate layout, two finger docks extending *mauka* into the harbor from the Makai Wharf would be constructed in lieu of Dock "C." The other elements of the proposed action would remain. Under this alternative, a total of 223 slips would be constructed, or 27 fewer slips than under the proposed action. This alternative would employ similar construction methodology to the proposed action, with similar potential environmental impacts. Because this alternative involves fewer slips and lineal feet of berthing, it is likely that the overall construction period would be shorter, resulting in reduced intensity of noise, marine water quality and biological impacts. Operational period traffic volumes generated from the harbor users would also be reduced from the proposed action, due to the smaller number of slips. This alternative is not carried through detailed environmental analysis because this EIS evaluates the potential impacts of the maximum development scenario (i.e., 250 slips as in the proposed action).

6.4.2 Large Excursion Vessel Berth

A second alternate layout for the harbor berthing and mooring infrastructure involved accommodation of a 250-foot excursion vessel in the harbor. In consideration of the navigability of such a large vessel, and due to limited space within the harbor, the only practical areas to moor her would be alongside the proposed maintenance dock situated adjacent to the current Honolulu Marine facility, or alongside the Fisherman's Wharf loading dock. The former location would change the intended use of the maintenance dock and limit the opportunities of the commercial and pleasure craft tenants to provide necessary maintenance to their vessels; the latter location would require dedicating the Fisherman's Wharf loading dock to a single large vessel in lieu of the proposed finger docks, resulting in a decrease of 52 slips for the full buildout of the project.

Furthermore, the use of the channel would likely need to be restricted to one-way vessel traffic while a vessel of this size is transiting, and access in or out of the harbor would be effectively halted while the vessel was performing turning maneuvers inside the basin, either on arrival or prior to departure. Vessels typically require an area between two to three times the vessels' length in diameter to be turned around. The lower range is suitable for vessels equipped with bow and/or stern thrusters that provide increased maneuverability. Without making further density reductions by shortening Docks A, B and C, the available room between the ends of the proposed docks and the Fisherman's Wharf Loading Dock is approximately 500 feet, or two times the design length of the proposed 250-foot excursion vessel. For comparison purposes, the *O'ahu Commercial Harbors 2020 Master Plan* states that the Star of Honolulu ("Star"), a 235-ft excursion vessel that previously operated from the Honolulu Marine facility, was "barely able to turn around in Kewalo Basin" (SDOT 1997). The vessel's operator has stated that the Star was designed and built to operate in confined space and can turn in her own length, and did not cause a harbor traffic problem when it operated from the wharf fronting the Honolulu Marine shipyard in years past. However, while the Star is more maneuverable than other vessels of its size, if it were to experience a mechanical failure of its thrusters, the vessel could block ingress and egress to the harbor and have a negative impact on harbor navigation. This vessel currently operates from Pier 8 at Honolulu Harbor.

Its operational considerations notwithstanding, this alternative would likely result in impacts to upland support areas and traffic circulation that differ from those of the proposed action in the following ways:

- Extensive land support areas would be required to accommodate tour buses needed to transport its passengers. For example, according to the *O'ahu Commercial Harbors 2020 Master Plan*, a fully loaded Star of Honolulu would accommodate 1,500 passengers—equivalent to 34 bus loads of 45-passenger buses (SDOT 1997).

- While most of the harbor-related vehicular ingress and egress to/from the harbor is via the three access points along Ala Moana Boulevard, the fleet of tour buses serving a 250-foot excursion vessel would likely access the west side of the harbor via ʻĀhui Street and result in a large increase in buses entering ʻĀhui Street during the PM peak hour. Because left turns from westbound Ala Moana Boulevard to ʻĀhui Street are not now permitted (and are not reasonably be expected to be permitted in the future), this alternative will result in additional left turns at the Ward Avenue/Ilalo Street intersection or at the Koula Street intersection.

- The existing Fisherman's Wharf dock structure may require extensive structural rehabilitation to accommodate a large vessel such as the Star and the added deck loads associated with its operations. A structural analysis would be needed to determine the required improvements. In addition, the infrastructure improvements (power, wastewater) needed to accommodate the Star or other large vessels at that berth would be greater than those needed for smaller craft.

While it may be possible for the Star (or similar large excursion vessel) to be accommodated alongside the Fisherman's Wharf area, a feasibility study is needed to determine the extent of dock- and land-side improvements that would be required. This is beyond the scope of this EIS, as a vessel of this size and passenger capacity—its previous berthing at a different wharf in Kewalo Basin notwithstanding—is not a current harbor user and there are no current plans for introduction or relocation of such a vessel to the harbor.

This alternate layout would not meet the project purpose and objectives described in Section 2.2 and thus, for purposes of the EIS analysis, it is not considered a "reasonable alternative." In the future, if a large excursion vessel is proposed for berthing in Kewalo Basin that requires improvements that are not covered in this EIS, a separate HRS Chapter 343 environmental assessment would be required.

6.5 Other Alternatives

HAR §11-200-17 (F) provides examples of types of alternatives to the proposed action that should be described in the Draft EIS, including the following.

6.5.1 Postponing the Project Pending Further Study

A number of technical studies have been undertaken or are being undertaken for the project. A recent (2007) condition study of selected Kewalo Basin dock structures indicated the need for repair and/or replacement of harbor infrastructure. Postponing the project would exacerbate and accelerate the deterioration of harbor infrastructure, causing potential adverse impacts to the commercial enterprises operating out of Kewalo Basin and loss of revenue to the HCDA.

6.5.2 Alternative Locations for the Proposed Project

Another of the alternative examples provided in HAR §11-200-17 (F) is the consideration of alternative locations for the proposed project. Under this alternative, the proposed harbor facilities are constructed at another location. The development of a new commercial harbor in a different location would likely have much greater environmental impacts than increasing the slip capacity of Kewalo Basin within its current footprint. For example, constructing a new harbor elsewhere on O‘ahu would likely involve the hardening of an existing natural shoreline, as well as extensive dredging, in addition to dock construction. This would result in a much longer construction period and greater impacts to both the marine and terrestrial environments. While it is hypothetically possible that the project could be developed elsewhere, it would require that HCDA secure development rights or control over another waterfront site and either redevelop or construct a new harbor facility. It is not reasonable to expect HCDA to acquire another site to provide modernized, upgraded harbor infrastructure while there is the potential to improve the facility currently under its jurisdiction. Therefore, this alternative will not be carried through the EIS analysis.

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Chapter 7: OTHER IMPACTS AND CONSIDERATIONS

7.1 Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term uses and long-term productivity consist of the project's short-term construction phases and the long-term benefits of the project after construction.

During construction, there will be short-term uses involving temporary water quality, air quality and noise impacts, and potentially interim reassignment of berths to accommodate in-water work. Short-term construction impacts can be minimized or mitigated by implementation of industry-standard construction BMPs and coordinating the timing of construction. Best management practices may include sedimentation control measures, preventing the release of fuel or other contaminants into the water column, and work management. The trade-offs among these short-term losses are the increase in employment and immediate economic benefits of construction-related activities.

In the long-term, the proposed action will increase the capacity of Kewalo Basin from 143 slips to about 250 slips, and improve services to the harbor users through utility upgrades, including new wastewater pumpouts, dedicated fire suppression system, and a dedicated fueling dock. Project buildout would also increase vessel traffic in and out of the harbor, though most of the new vessels are expected to be pleasure craft, which contribute very low daily volumes of vessel traffic. The long-term increase in vessel traffic is not expected to significantly affect protected species or recreational uses in the vicinity.

The project will not contribute significant traffic volumes on arterial roadways serving the area (see Section 4.2 for discussion of traffic). Most of the long-term traffic increases would be associated with other long-term development projects in the area.

The proposed action will increase the range of beneficial uses of the environment by providing improved dock infrastructure and associated utility services for existing and future commercial and recreational users of the harbor. The project would not affect the prioritization of how berths are assigned Kewalo Basin. Charter or cruise boats will continue to have priority in the assignment of Front Row berths with or without the project. With respect to all other berths, commercial fishing boats have the highest priority, followed by charter or cruise boats. Pleasure craft will have the lowest priority in the assignment of berths, with or without the project.

The project will comply with all applicable Federal, State and County regulations governing project development and implementation, including compliance with conditions associated with forthcoming Department of the Army and SMA permits.

In the long term, the proposed action will provide positive economic and social benefits, such as the following:

- removal of existing damaged and deteriorated docks;
- improved safety for current and future harbor users;
- increased public access to the water;
- provision of modernized dock infrastructure that allows for the continuation of Kewalo Basin as an important commercial and recreational waterfront asset;
- provision of improved utility services for the harbor users;
- provision of a dedicated dock-side fire suppression system;
- provision of sewage pumpout system for harbor users who currently must discharge wastewater three miles from shore or at permitted sewage pumpouts at other harbor facilities;
- reduction in environmental risks associated with the lack of sewage pumpout;
- provision of a dedicated fuel dock that is subject to strict permitting controls;
- reduction in environmental risks associated with the current system of fuel delivery by providing better spill prevention control;
- accommodation of anticipated future demand for commercial and pleasure craft slips, as the island's population grows;
- short-term economic benefits from project design and construction;
- long-term public benefits of adequate and expanded berthing facilities; and
- long-term economic benefits from providing modernized facilities and dockside services that facilitate commercial operations utilizing the berths.

As a result, the proposed action will contribute to the maintenance and enhancement of long-term productivity for the people of O‘ahu in general.

7.2 Cumulative Impacts

Cumulative impacts are those that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Together with other existing and anticipated future development in the area, the project has the potential to generate cumulative impacts on: 1) transportation facilities and operations in the area; 2) marine water quality; 3) and marine biological resources.

The analysis of cumulative impacts takes into account other future development in the Kaka‘ako region, where foreseeable and relevant. In particular, the following two projects in the region are addressed in the analysis of cumulative impacts, as they will be initiated and/or completed within the timeframe of the proposed action.

- Kaka‘ako Draft Mauka Area Plan. This plan updates HCDA's Mauka Area Plan, which was adopted in 1982. A Final Supplemental Environmental Impact Statement (FSEIS) for the updated Kaka‘ako Draft Mauka Area Plan was accepted in 2009. The Draft Mauka Area Plan conceptualizes a high-density urban center where mixed-use continues to be the primary land use in order to maximize the potential of each lot while preserving existing uses (Edaw, Inc. 2009).

- Honolulu Seawater Air Conditioning Project. This project will construct a seawater air conditioning system in downtown Honolulu, consisting of a seawater intake pipe extending about 4 to 5 miles offshore to a depth of about 1,600 to 1,800 feet, a return pipe extending 3,500 offshore to a depth of 150 feet, a pump station in the Kaka'ako Makai District, and a network of chilled water distribution pipes from the pump station to customer buildings in the downtown area (TEC, Inc. 2009). This project is expected to start construction in 2011 and and be operational in 2012.

The following discussion of potential cumulative impacts focuses on the following resources as the proposed action has the potential to impact these resource areas either beyond the construction period or beyond the project boundaries.

Traffic. The estimation of future impacts is important for cumulative impact analysis. However, the focus must be on "reasonably foreseeable" actions which are those that are likely to occur or probable, rather than those that are merely possible or subject to speculation. The prediction of reasonably foreseeable impacts thus requires judgment based on information obtained from reliable sources such as adopted plans and similar documents. Based upon this framework, the methodology used in the project traffic assessment (Appendix E) takes into account and evaluates the cumulative impacts on transportation infrastructure. The discussion of potential traffic impacts includes additional traffic generated by the Kaka'ako Draft Mauka Area Plan development, as described in its FSEIS, as well as background growth from local traffic to/from existing land uses. The methodology used in the traffic assessment to evaluate and account for cumulative impacts is explained below.

The traffic assessment study area was based on comments from the SDOT for the Kewalo Basin repairs project EISPN. The timeframe for the analysis included the project's build-out year of 2025 along with an interim study year of 2012. The relevant segments of the existing transportation system and present levels of operation were described in the traffic assessment. The study incorporated the schedule for the Kaka'ako Draft Mauka Area Plan over the project period. Traffic projections were updated to include the project related traffic over the without-project conditions to identify project impacts. Therefore, these results (i.e., no significant effect) identify the cumulative effects of the project as they include the impacts of other developments and growth affecting the study area.

Marine Water Quality and Marine Biological Resources. According to its Final EIS (TEC, Inc. 2009), the Seawater Air Conditioning project would have some unavoidable impacts to offshore ecosystems during construction due to increased turbidity and in-water work. During construction, there would be some obstructions in nearshore waters off the Kaka'ako coast (west of Kewalo Basin) in which protected species such as whales and sea turtles may traverse. Mitigation measures and BMPs identified in the Final EIS would minimize potential impacts to water quality and marine communities. Operation of the seawater air conditioning system would impact offshore water quality due to the return seawater flow into marine waters.

As described in Chapter 4, implementation of the Kewalo Basin repairs project would not cause significant loss of biotic elements and is not likely to adversely affect protected species. The project impacts are anticipated to be temporary and will be mitigated through the implementation of BMPs to contain the turbidity and resuspension of sediments in the vicinity of the in-water work. Within the harbor, there are no coral communities that would be affected by the water quality impacts; existing harbor fauna consist primarily of highly tolerant fouling organisms (alien species).

In-water construction activities of both the Seawater Air Conditioning project and the Kewalo Basin repairs project may occur concurrently or overlap in time. The Seawater Air Conditioning project's pipes and other underwater infrastructure would be located at least 2,000 feet to the west of the Kewalo Basin entrance channel in much deeper waters. Biotic communities in each area differ, with those in Kewalo Basin comprised primarily of fouling communities and alien species. Although both projects have the potential to impact protected marine species during their respective construction periods, BMPs (e.g., visually surveying the surrounding marine waters and ceasing activities if protected species are present) will be implemented in both projects to reduce or eliminate adverse effects on protected species. Therefore, no significant cumulative impacts to marine water quality or marine biological resources are expected from the proposed action when considered together with the Honolulu Seawater Air Conditioning project.

7.3 Secondary Impacts

Secondary impacts include those that are caused by the project and occur later in time or farther removed in distance but are still reasonably foreseeable. They may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rates, regardless of who initiates the action. Potential secondary impacts or indirect effects are discussed in Chapters 3 and 4, and include: potential impacts to water quality, marine resources, cultural practices, and recreational activities due to construction-related sedimentation and noise.

The proposed action will not change land use of the project area; it is intended to allow for the continuation of existing commercial fishing, excursions, and pleasure boating activities at Kewalo Basin through repair and replacement of wharf infrastructure, as well as upgrading dock-side utility services. In the long-term, the conceptual buildout plan accommodates anticipated future demand for commercial and recreational berths resulting from future growth in the State's population. It represents a configuration that maximizes the slip capacity of the harbor; however, if future conditions do not warrant an increase in slips (i.e., demand for slips does not grow), the buildout scenario would not be fully implemented. Therefore, the project will not induce population growth through out of state in-migration.

7.4 Irreversible and Irretrievable Commitments of Resources

The project would result in the irreversible and irretrievable commitment of certain natural and fiscal resources. Major non–renewable resource commitments include the project site and the financing, construction material, labor, and energy required for the project's implementation. The potential impacts represented by the commitment of these resources, however, should be weighed against the positive socio-economic benefits that could be derived from the project versus the consequences of either taking no action or pursuing another less beneficial use of the property.

The proposed project will facilitate the harbor's long history of use as a commercial fishing port; it does not involve dredging, significant alterations to the existing historic bulkheads, or enlargement of the harbor boundaries. The installation of new fixed or floating docks would not irreversibly commit natural resources. As noted in Section 3.8 Marine Biological Resources, the fouling communities attached to the pilings that would be removed are not protected or otherwise sensitive species and would quickly recolonize on the new hard surfaces introduced by the project.

As with any construction activity, resources such as fossil fuels and construction material will be irrevocably committed. Labor will be required for planning, engineering, and construction. Once operational, the new berths would be provided with increased utility services made possible by the project.

There is always the risk of environmental accidents resulting from any phase of project implementation which may cause irreversible damage to the environment (e.g., leaks from fuel tanks, additional vessel groundings). The possibility of environmental accidents will be mitigated by observing all applicable environmental laws and regulations and following BMPs to help prevent and respond to any environmental accidents. As described in Section 2.3 Project Description, the fuel storage tanks would include design elements and redundancies to minimize the risk of fuel leaks into the terrestrial or marine environment. As described in Section 4.1.2, the proposed action is not expected to significantly increase the incidence or risk of vessel groundings.

7.5 Probable Adverse Environmental Effects that Cannot be Avoided

This section describes the project's potential long-term adverse impacts that may be unavoidable and the rationale for proceeding notwithstanding the unavoidable effects.

Construction Period Noise. Construction period noise levels are likely to exceed the daytime maximum permissible noise limits at the property line on an interim basis, primarily due to pile extraction and pile driving. A State DOH permit for construction noise will be obtained and its conditions complied with. Construction duration will depend on the final project design and type of docks installed (i.e., fixed or floating) and pile installation is likely to occur over 8 to 12 months in Phase 1, at intermittent periods to suit the sequence of demolition and construction. Demolition of each dock will take approximately one month and installation of new docks would require one to two months (depending on whether it is fixed or floating). The underwater noise analysis indicated that criteria noise values for protected marine species would not be exceeded outside the harbor entrance. Best management practices such as a visual scan of the harbor waters could be employed to reduce potential impacts to protected species if they should enter the radii of concern prior to commencement of pile driving activities. Pile driving would not commence until the protected species voluntarily leaves the radii of concern.

Construction Period Water Quality. In-water work (e.g., pile installation) will result in temporary resuspension of marine sediments, which would have potential short-term impacts on marine water quality in the harbor. The marine surveys found that there are no sensitive or protected species in the harbor. Furthermore, because BMPs such as turbidity curtains would be employed at the local in-water work areas, and because the fouling communities are already subjected to adverse environmental conditions in the harbor, significant adverse impacts are not likely. In-water construction will require Department of the Army and SMA permits, and specific BMPs and mitigation measures will be developed in consultation with the appropriate regulatory agencies.

7.6 Rationale for Proceeding with the Project Notwithstanding Unavoidable Effects

In spite of the above mentioned unavoidable effects, the project should proceed because potential adverse impacts will be temporary, minimized, mitigated to insignificant levels, or offset by substantial benefits. The proposed project will have benefits to offset its potential unavoidable adverse impacts to noise and water quality. These potential effects will be offset by the following benefits:

- Adequate and/or improved dock infrastructure for existing harbor tenants;
- Capacity to accommodate future growth;
- Improved utility services for existing and future harbor tenants;
- Reduction in environmental risks associated with lack of sewage pumpout system and dedicated fuel dock; and
- Short- and long-term economic benefits from project construction and the provision of modernized facilities and services serving commercial operators.

7.7 Unresolved Issues

There are two that remain unresolved at the time of the preparation of this EIS, described below. They will be resolved prior to undertaking the proposed action.

- Identification of specific BMPs and mitigation measures for potential noise and water quality impacts in consultation with relevant Federal and State regulatory agencies.
- Land Use District boundary interpretation by the State Land Use Commission.

Chapter 8: PREPARERS

EIS PREPARER

Helber Hastert & Fee, Planners	Scott Ezer Gail Renard, LEED AP Corlyn Olson Orr Ronald Sato, AICP Martha Spengler, Registered Environmental Assessor

PLANNING, ENGINEERING, & DESIGN

Moffatt & Nichol	Russell Boudreau, P.E. Dean Kokubun, P.E. Rob Sloop, P.E. Victor Szabo, P.E.

ARCHAEOLOGICAL IMPACTS

Cultural Surveys Hawaiʻi	Hallet Hammatt, Ph.D. David W. Shideler, M.A.

CULTURAL IMPACTS

Cultural Surveys Hawaiʻi	Joseph H. Genz, Ph.D. Hallet Hammatt, Ph.D.

HISTORIC ASSESSMENT

Mason Architects, Inc.	Glenn Mason, AIA Polly Cosson Tice

NOISE

D.L. Adams Associates	Dana Dorsch

TRAFFIC

Julian Ng, Inc.	Julian Ng, P.E., PTOE

UNDERWATER NOISE EVALUATION	John Goody

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Chapter 9: REFERENCES

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Chapter 10: PARTIES CONSULTED DURING THE PREPARATION OF THE DRAFT EIS

10.1 Agencies, Citizen Groups and Individuals Consulted During the Assessment Process

Federal

U.S. Army Corps of Engineers
U.S. Department of Commerce, NOAA National Marine Fisheries Service

State

Department of Land and Natural Resources, Office of Conservation and Coastal Lands
Department of Business, Economic Development and Tourism, Office of Planning
Department of Business, Economic Development and Tourism, Land Use Commission

City

Department of Planning and Permitting

Other

Kewalo Basin Stakeholder Advisory Group

10.2 Agencies and Community Groups to be Consulted During EIS Process

The following agencies, organizations, public utilities, and elected officials were consulted in the preparation of the Draft EIS. Copies of the EISPN were sent to the agencies, organizations, and individuals listed below, with a request for their comments on the project. The public comment period for the EISPN ran from April 8, 2010 through May 8, 2010. Those who formally replied with written comments to the EISPN are indicated with a ✓. Copies of comments received and responses provided are included at the end of this chapter.

Federal

✓ U.S. Army Corps of Engineers, Honolulu District
✓ U.S. Department of Commerce, NOAA National Marine Fisheries Service
✓ NOAA Pacific Island Fisheries Science Center
U.S. Fish and Wildlife Service
U.S. Coast Guard
U.S. Environmental Protection Agency

State

Department of Business, Economic Development and Tourism (DBEDT)
DBEDT, Office of Planning
Department of Health
✓ Department of Land and Natural Resources
DLNR Historic Preservation Division
✓ Department of Public Safety
✓ Department of Transportation
✓ Office of Hawaiian Affairs
✓ University of Hawai‘i
UH Environmental Center

City

✓ Board of Water Supply
✓ Department of Design and Construction
Department of Environmental Services
Department of Facility Maintenance
Department of Planning and Permitting
✓ Department of Parks and Recreation
✓ Department of Transportation Services
✓ Fire Department
✓ Police Department

Elected Officials

State Senator Brickwood Galuteria, Senate District #12
State Representative Tom Brower, House of Representatives District #23
Councilmember Charles Djou
Councilmember Rod Tam
Ala Moana/Kaka‘ako Neighborhood Board No. 11

Utility Companies

HECO
✓ Hawaiian Telcom

Citizen Groups, Individuals, and Consulted Parties

Almar Management
Friends of Kewalo Basin Park Association
Honolulu Marine, Inc.
Kaka‘ako Improvement Association
Kaka‘ako Makai Community Planning Advisory Council

Kamehameha Schools/Bishop Estate
Kewalo Basin Stakeholder Advisory Group
- ✓ Reg White
- ✓ Hawaiʻi Longline Association

Kewalo Keiki Fishing Conservancy
Kewalo Wharf, LLC
Ocean Investments, LLC

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

May 5, 2010

Regulatory Branch

File Number: POH-2009-00303

RECEIVED
MAY - 6 2010
HELBER, HASTERT & FEE PLANNERS

Scott Ezer
Helber Hastert & Fee, Planners, Inc.
Pacific Guardian Center
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

This responds to your request for comments on a Final Environmental Assessment/ Environmental Impact Statement Preparation Notice (EA/EIS) for the Kewalo Basin Repair Project located in the Kona District of Honolulu, Island of Oahu, Hawaii (TMK: (1)2-1-058:pors. 001, 002, 035 & 095). The project involves the replacement of dilapidated piers and the installation of fixed and floating piers to provide an additional 100+ boat slips within the marina basin. The proposed project was reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404).

Section 10 requires that a Department of the Army (DA) permit be obtained for certain structures or work in or affecting navigable waters of the United States (U.S.), prior to conducting the work (33 U.S.C. 403). Navigable waters of the U.S. are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or other waters identified as navigable by the Honolulu District. Some typical examples of structures or work requiring Section 10 permits within this jurisdictional area include boat ramps, breakwaters, bulkheads, dredging, filling or discharging material such as sand, gravel or stones, groins and jetties, mooring buoys, piers boat hoists, pilings and construction of marina facilities. The proposed work will require a Section 10 permit.

Section 404 requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344). The area of Corps jurisdiction under Section 404 extends to the Mean Higher High Tide Line (MHHTL) of the Pacific Ocean, and to the upland boundary of any adjacent wetlands. Projects involving discharges typically include placement of fill material for homes and landscaping, impoundments, causeways, road fills, dams and dikes, riprap, groins, breakwaters, revetments, and beach nourishment. Section 404 also regulates discharges of dredged material incidental to certain activities such as grading, mechanized landclearing, ditching or other excavation activity, and the installation of certain pile-supported structures. The proposed work may require a Section 404 permit if any discharge of dredged or fill material is proposed.

We recommend the EA/EIS address potential project impacts to public navigation, safety and water quality as a result of the proposed fuel dock installation and a substantial increase in the number of vessels within the confines of the marina. Rapid response fuel spill remediation plans should be in place for use in the event of an accidental spill. Use of Best Management Plans to minimize potential adverse impacts to the aquatic environment, due to construction, should be incorporated into the project plans. Although the plan does not discuss any proposed dredging, we recommend the bathymetry of the basin be studied to determine the likelihood of the need for future dredging and, if possible, incorporate those plans into the construction sequence in order to avoid minimizing impacts to navigation within the existing marina basin. To avoid the appearance of piece-mealing, we request your DA permit application contain all likely work proposed within the next five years for the project site, including possible bulkhead repair and dredging.

Thank you for providing us the opportunity to comment. Please contact Mr. Robert Deroche, of my staff, at 438-2039 or by email at robert.d.deroche2@usace.army.mil if you have questions and refer to File Number POH-2009-00303 regarding this project location.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. George P. Young, P.E., Chief
Regulatory Branch, CEPOH-EC-R
U.S. Army Engineer District, Honolulu
Fort Shafter, HI 96858-5440

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Young,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated May 5, 2010 (File No. POH-2009-00303). We offer the following responses.

1. The Draft EIS will note that the project will require a Department of the Army (DA) Section 10 permit. A DA Section 404 permit is not likely to be required as the project does not propose any discharge of dredged or fill material.
2. The Draft EIS will address potential project impacts to public navigation, safety and water quality (including potential best management practices and/or spill response plan for the fuel dock), as recommended in your letter.
3. The Draft EIS will note that a bathymetric survey has been completed for the harbor and indicates no dredging is required in the harbor in the foreseeable future. In addition, no funding for dredging work has been appropriated.
4. Phase I of the proposed harbor improvements project is the only work proposed within the next five years for the project site; no bulkhead repair or dredging is planned for the harbor within this five-year period.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

Gail Renard

From: Robert.Schroeder@noaa.gov
Sent: Thursday, May 06, 2010 11:47 PM
To: tony@hcdaweb.org; Gail Renard
Cc: Alan Everson; Gerry Davis; Danielle Jayewardene; Donald Hubner; Steve.Kolinski@noaa.gov
Subject: Re: Kewalo Basin Repairs Project Final EA/EISPN

Mr. Ching,

NOAA PIRO Habitat Conservation Division (HCD) has reviewed the FEA/EISPN for the Kewalo Basin Repairs Project, as proposed by the Hawaii Community Development Authority (HCDA) in accordance with HAR.
We understand that the proposed action will include repairs and replacement of wharf infrastructure, piers, piles, dockside utilities, and bulkheads. Potential number of slips could be increased from 150 to 250. We further understand that this activity is necessary to continue adequate support for commercial fishing and excursion vessels that utilize the harbor.

Marine resources in the harbor are likely to be impacted by the proposed activities. We are aware that marine surveys to assess these resources have just been completed and the forthcoming report should indicate the extent and anticipated significance of such impacts, as part of the Draft EIS. A number of alternatives will be evaluated in the EIS. We recommend that the EIS included full measures to avoid, minimize, and mitigate any and all significant impacts to Essential Fish Habitat (EFH) and marine resources, through BMPs and related actions. We further recommend that the EIS include mitigation plans to protect coral reefs just outside the harbor in the event of an oil spill or vessel grounding.

We look forward to reviewing the DEIS and thank you for providing us the opportunity to comment at this stage.

Mahalo,

Bob

Robert.Schroeder@noaa.gov
NOAA Fisheries-PIRO
Habitat Conservation Division
Honolulu, HI
Tel. (808) 944-2158

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Robert Schroeder
National Oceanic and Atmospheric Administration
National Marine Fisheries Service – Pacific Islands Regional Office
Habitat Conservation Division
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Schroeder,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your email message dated May 6, 2010. We offer the following responses.

As recommended in your comments, the Draft EIS will include a discussion of the project's potential impacts on marine resources, as well as proposed mitigation measures and typical best management practices (BMPs) to avoid and/or mitigate the anticipated impacts. Specific mitigation measures will be identified as conditions of the Department of the Army (DA) permits required for this action. Your agency will be consulted during the DA permit review process. The Draft EIS will also include a discussion of standard operating procedures and/or likely BMPs that are or will be implemented to reduce the likelihood of oil spills or vessel groundings in order to protect marine resources within and outside the harbor entrance.

We appreciate your input and participation in the EIS process. Your email message and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Fisheries Science Center
2570 Dole St. • Honolulu, Hawaii 96822-2396
(808)983-5300 • Fax: (808)983-2902

May 5, 2010

Ms Gail Renard
Helber, Hastert & Fee, Planners
733 Bishop Street, Suite 2590
Honolulu, HI 96813

Dear Ms. Renard:

This letter is in response to your request for comments regarding the Kewalo Basin Repairs project scheduled to begin sometime late in 2011. Our main concerns with this project are issues with noise and dust pollution which will potentially affect our offices, personnel, and work areas along the mauka side of the main building adjacent to the loading dock. This work will impact our ability to maintain consistent access and services to our facility via the driveway leading to our main gate which is located on the Diamond Head end of the building.

As you may recall, there have been previous situations where relatively small scale electrical and sewage repairs to the roadway, pier, and driveway easement caused these areas to be excavated for extended periods of time, thus severely limiting our access to our facility. We often have to move boats, trailers, large trucks, and equipment in and out of our facility and we have regular deliveries where large freight and service trucks need to have enough room to access the driveway leading into our loading and storage areas.

Should you have any questions or need more information please contact our Kewalo Facility Manager, Robert Dollar at 983-5702. Thank you for the opportunity to provide comments.

Sincerely,

Susan K. Kamei
Executive Officer

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Ms. Susan K. Kamei, Executive Officer
National Oceanic and Atmospheric Administration
National Marine Fisheries Service – Pacific Islands Fisheries Science Center
2570 Dole Street
Honolulu, HI 96822-2396

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Ms. Kamei,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated May 5, 2010. We offer the following responses.

The Draft EIS will note that short-term, temporary construction period noise and air quality impacts will result from the proposed harbor improvements. The construction contractor will obtain and comply with relevant Department of Health permits regulating construction period air quality and noise.

Most of the construction activities will take place from construction barges demolishing and removing existing substandard pier infrastructure. Construction staging is anticipated to be located on the west side of the harbor; thus, no long term closures of the roadway accessing your facility are expected. We recognize it is sometimes unavoidable for construction activities to inconvenience surrounding uses; however, the project owner (Hawai'i Community Development Authority) will coordinate the details of construction with all its tenants in the affected area to minimize disruption to their operations and working conditions.

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

We appreciate your input and participation in the EIS process. Your email message and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
MAY - 5 2010
HELBER, HASTERT & FEE PLANNERS

May 3, 2010

Mr. Anthony Ching, Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Dear Mr. Ching:

Subject: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comment.

Other than the comments from Division of Boating & Ocean Recreation, Land Division-Oahu District, Division of Aquatic Resources, Engineering Division, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Historic Preservation will be submitting comments through a separate letter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Morris M. Atta
Acting Administrator

Cc: Helber Hastert & Fee, Planners

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 8, 2010

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
__ Div. of Forestry & Wildlife
x Div. of State Parks
__ Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District

FROM: Morris M. Atta
SUBJECT: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project
LOCATION: Island of Oahu
APPLICANT: Helber Hastert & Fee, Planners on behalf of Hawaii Community Development Authority

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by May 2, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed:
Date: 4/12/2010

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 8, 2010

RECEIVED
LAND DIVISION
2010 APR 15 P 3 00
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
- x Div. of Aquatic Resources
- x Div. of Boating & Ocean Recreation
- x Engineering Division
- __Div. of Forestry & Wildlife
- x Div. of State Parks
- __Commission on Water Resource Management
- x Office of Conservation & Coastal Lands
- x Land Division –Oahu District

FROM: for Morris M. Atta Charlene
SUBJECT: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project
LOCATION: Island of Oahu
APPLICANT: Helber Hastert & Fee, Planners on behalf of Hawaii Community Development Authority

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by May 2, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed: [signature]
Date: 4/14/10

APR12'10AM10:49

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 8, 2010

RECEIVED
LAND DIVISION
2010 APR 20 A 9 49
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
- x Div. of Aquatic Resources
- x Div. of Boating & Ocean Recreation
- x Engineering Division
- __Div. of Forestry & Wildlife
- x Div. of State Parks
- __Commission on Water Resource Management
- x Office of Conservation & Coastal Lands
- x Land Division –Oahu District

FROM: for Morris M. Atta Charlene
SUBJECT: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project
LOCATION: Island of Oahu
APPLICANT: Helber Hastert & Fee, Planners on behalf of Hawaii Community Development Authority

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by May 2, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

'10 APR 09 AM08:22 ENGINEERING

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]
Date: 4/16/10

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/ MorrisAtta
REF: FEA/EISPN for Kewalo Basin Repairs Project
Oahu.011

COMMENTS

(X) **We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zones A and AE. The National Flood Insurance Program regulates developments within these zones as indicated in bold letters below.**

( ) Please take note that the project site according to the Flood Insurance Rate Map (FIRM), is located in Zone ___.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

(X) **Please note that the project site must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.**

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

(X) **Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.**
( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.
( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: ______________________________

( ) Other: ______________________________

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: [signature]
CARTY S. CHANG, ACTING CHIEF ENGINEER
Date: 4/13/10

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

AQUATIC RESOURCES: 3701	
DIRECTOR	
COMM. FISH.	
AQ RES/ENV	
AQ REC	
PLANNER	
STAFF SVCS	
RCUH/UH	
STATISTICS	
AFRC/FED AID	
EDUCATION	
SECRETARY	
OFFICE SVCS	
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BDS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 8, 2010

MEMORANDUM

RECEIVED APR 9 2010 AQUATIC RESOURCES

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x ~~Div. of Boating~~ & Ocean Recreation
x Engineering Division
__Div. of Forestry & Wildlife
x Div. of State Parks
__Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District

FROM: for Morris M. Atta [signature]
SUBJECT: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project
LOCATION: Island of Oahu
APPLICANT: Helber Hastert & Fee, Planners on behalf of Hawaii Community Development Authority

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by May 2, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: [signature]
Date: 4-27-10

RECEIVED LAND DIVISION 2010 APR 28 P 2:59 DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

Date: 4/27/2010

MEMORANDUM

TO:	Bob Nishimoto, Program Manager
FROM:	Brett Schumacher
THRU:	Alton Miyasaka, Aquatic Biologist
SUBJECT:	Comments on Draft EIS Preparation Notice

Comment	Date Request	Receipt	Referral
	4/9/10	4/9/2010	4/9/2010

Requested by: Morris Atta
Department of Land and Natural Resources, Land Division

Summary of Proposed Project

Title: Kewalo Basin Harbor Repairs

Project by: Hawaii Community Development Authority

Location: Honolulu, Oahu

Brief Description: The applicant proposes to make improvements to the Kewalo Basin Harbor facility located in Honolulu, Oahu.

Comments: The preparation notice indicates that water quality sampling will be conducted as part of the EIS process. However, the DAR notes that an analysis of benthic sediments is not presently planned. Resident boats (with anti-fouling paint), a boat repair facility, and runoff from urban lands have likely affected the physical and chemical make-up of the sediments in this harbor for many years. As such a variety of organic and inorganic toxins may currently be sequestered in the sediments. Resuspension of these sediments could adversely affect marine biological resources and human health, and the DAR feels that it is imperative to understand the nature of these sediments in order to assess the risks associated with the proposed project.

The preparation notice indicates that "best management practices" will be used to mitigate effects of resuspension of these sediments. In order to assess the suitability of these practices, the EIS should detail what these practices are, and how effective they are at preventing spread of resuspended sediments and toxins (i.e. what are the expected differences in concentration of these sediments inside and outside containment measures). Information is also required about likely dispersal scenarios inside and outside of the harbor in the event of a containment failure. In addition to increased turbidity that is expected during construction activities, the DAR also notes that turbulence from vessels in the harbor can resuspend sediments (e.g. a sediment plume is evident inside the harbor after a large vessel embarked in Figure 4 of the preparation notice).

Given that the proposed harbor improvements will increase vessel capacity in the harbor, information is needed to assess the effect of this change on the volume of boat traffic and associated long-term changes in turbidity and water quality.

Several species of marine fish (`oama (*Mulloidichthys* spp.), halalu (*Selar crumenophthalmus*), `iao (*Antherinomorus insularum*) recruit seasonally to harbors such as Kewalo Basin and provide an important resource to the fishing community in Hawai`i. Considering the concerns cited above, the DAR requests that potential impacts to these resources from suspension of sediments, disturbance due to construction, and access to fishing areas should be detailed in the EIS.

The DAR regulates take of several groups of sessile invertebrates, including filter-feeding bivalves such as oysters (*Pinctada margaritifera*, *Crassostrea* spp.) and several species of coral. These organisms could be affected by the proposed project due removal of the pilings on which they have attached or from an effects of resuspended sediments. The DAR suggests that efforts be made during biological assessments to assess resident populations of such species.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 11, 2010

RECEIVED
MAY 13 2010
HELBER, HASTERT & FEE PLANNERS

Mr. Anthony Ching, Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Dear Mr. Ching:

Subject: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to Division of State Parks for their review and comment.

The Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene Unoki
Assistant Administrator

Cc: Helber Hastert & Fee Planners

LINDA LINGLE
GOVERNOR OF HAWAII

BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
STATE PARKS DIV

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

'10 APR -9 A10:11

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT OF LAND & NATURAL RESOURCES

April 8, 2010

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
__ Div. of Forestry & Wildlife
x Div. of State Parks
__ Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District

RECEIVED LAND DIVISION
2010 MAY -6 A 9:4
DEPT OF LAND & NATURAL RESOURCES STATE OF HAWAII

FROM: for Morris M. Atta Charlene
SUBJECT: Final Environmental Assessment/Environmental Impact Statement Preparation Notice for Kewalo Basin Repairs Project
LOCATION: Island of Oahu
APPLICANT: Helber Hastert & Fee, Planners on behalf of Hawaii Community Development Authority

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by May 2, 2010.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]
Date: 5/4/10

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Morris M. Atta, Acting Administrator
State of Hawai'i
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Atta,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in letters dated May 3 and May 11, 2010. We note that the following divisions had no comments: Land Division-O'ahu District, Division of Boating and Ocean Recreation, and Division of State Parks. We offer the following responses to the comments made by the Engineering Division and Division of Aquatic Resources.

Engineering Division

Thank you for confirming the flood zones as reported in the EISPN. The Draft EIS will include this information. The project will not introduce new development on fastlands within the Special Flood Hazard Area.

Division of Aquatic Resources (DAR)

1. Baseline benthic sediment sampling and analysis was conducted for the project area. The Draft EIS will include a discussion of the sampling analysis.
2. The Draft EIS will include a discussion of typical and/or likely construction period best management practices (BMPs) to reduce impacts that may occur due to resuspension of harbor sediments during construction. Specific mitigation measures will be identified and imposed as conditions to the Department of the Army (DA) permits required for this project. Your agency will be consulted during the DA permit process.
3. The Draft EIS will also discuss the likelihood and potential impacts of the buildout scenario on harbor water quality (including turbidity).
4. The Draft EIS will include a discussion of the project's anticipated impacts to marine fish and fisheries.

5. The Draft EIS will address the project's potential likely impacts on DAR-regulated sessile invertebrates.

We appreciate your input and participation in the EIS process. Your comments and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Rec'd 4/14/10

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF PUBLIC SAFETY
919 Ala Moana Boulevard, 4th Floor
Honolulu, Hawaii 96814

CLAYTON A. FRANK
DIRECTOR

DAVID F. FESTERLING
Deputy Director
Administration

TOMMY JOHNSON
Deputy Director
Corrections

JAMES L. PROPOTNICK
Deputy Director
Law Enforcement

No. 2010-659

April 13, 2010

Mr. Scott Ezer, Vice President
Helber, Hastert and Fee, Planners, Inc.
733 Bishop Street, Suite 2590
Honolulu, HI 96813

RE: Final Environmental Assessment/Environmental Impact Statement Preparation Notice - Kewalo Basin Repairs Project, Kona District, Island of Oahu (Honolulu Judicial District), TMK: 1-2-1-058: pors, 001, 002, 035, 095

Dear Mr. Ezer:

This is in response to your letter dated April 6, 2010 requesting the Department of Public Safety (PSD) to comment on the abovementioned Final Environmental Assessment/ Environmental Impact Statement Preparation Notice. PSD notes the role its division of law enforcement will play in the good governance of the Kewalo Basin.

Although the Department has nothing further to add at this time, please consider seeking feedback from PSD during the draft Environmental Impact Statement review phase.

Please direct any questions you may have to John Borders, Capital Improvement Projects Coordinator, at (808) 587-3463 or by e-mail at john.s.borders@hawaii.gov. Thank you for inviting PSD to participate in this review.

Sincerely,

Clayton A. Frank
Director

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Clayton A. Frank, Director
State of Hawaiʻi
Department of Public Safety
919 Ala Moana Boulevard, 4th Floor
Honolulu, HI 96814

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, Oʻahu, Hawaiʻi
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Frank,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated April 13, 2010 (No. 2010-659). We acknowledge your comment that your department notes its law enforcement role in the good governance of Kewalo Basin. We will continue to include your department as a consulted party in the Draft EIS Review.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

STP 8.0141

June 22, 2010

Mr. Anthony Ching
Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Dear Mr. Ching:

Subject: Kewalo Basin Repairs Project
Final Environmental Assessment (FEA) and
Environmental Impact Statement Preparation Notice (EISPN)

The State Department of Transportation (DOT) previously commented on the subject project in its letter STP 8.0096 dated May 6, 2010 (copy attached), and now offers the following supplemental comments by the DOT Highways Division staff:

1. The project will generate additional traffic that will impact Ala Moana Boulevard, State Route 92, which is functionally classified as a principal arterial, intended to move traffic efficiently between regions.

2. The Traffic Assessment (TA) that will be included in the Draft Environmental Impact Statement (DEIS) should assess the impact of the planned project on Ala Moana Boulevard and recommend mitigation measures at the end of the first phase and at full build-out.

3. Section 3.2.8 states that Kewalo Basin Harbor and the adjacent five-acre Kewalo Basin Park share access from Ala Moana Boulevard. All access roads and driveways to the project and the park from Ala Moana Boulevard should be shown on a site plan and described in the narrative. Observations of existing conditions at the access points during the a.m. and p.m. peak hours should be described.

4. The EISPN shows the project area as under water, but the project should also include the harbor parking and land that will be used for the planned improvements. The existing number of parking stalls for the harbor and the planned number of parking stalls should be described in the narrative and shown on the site plans. The planned harbor parking should be designed to prevent queuing on Ala Moana Boulevard.

5. The DEIS should disclose if harbor parking is shared with such other developments in the vicinity, such as Fisherman's Wharf Restaurant, John Dominis Restaurant, National Oceanic and Atmospheric Administration (NOAA) Pacific Island Fisheries Science Center, and the charter school.

6. The impact of additional project-generated traffic to motor vehicle traffic, bicyclists and pedestrians on Ala Moana Boulevard should be assessed and mitigation recommended.

7. Permits are required for work in the State highway right-of-way and for oversize and overweight vehicles. Plans for construction in the State highway right-of-way must be submitted for review and approval by the Highways Construction and Maintenance Branch. All improvements in the State highway right-of-way must be planned, designed and constructed to AASHTO standards and provided at no cost to the State Department of Transportation.

8. No additional stormwater runoff will be permitted in the State highway right-of-way.

DOT appreciates the opportunity to provide comments and requests four (4) copies of the completed DEIS and TA of which a paper copy of the DEIS and two paper copies of the Traffic Assessment will be needed. If there are any questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 587-2356.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

Attach.

✓c: Gail Renard, Helber, Hastert & Fee, Planners

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

STP 8.0096

May 6, 2010

Mr. Anthony Ching
Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Dear Mr. Ching:

Subject: Kewalo Basin Repairs Project
Final Environmental Assessment (FEA) and
Environmental Impact Statement Preparation Notice (EISPN)

Thank you for providing the subject project for the State Department of Transportation's (DOT) review. DOT understands that the Hawaii Community Development Authority (HCDA) proposes to repair and/or replace wharf infrastructure at Kewalo Basin. The project includes repairing and/or replacing: piers, supporting piles, dockside utilities, and bulkheads

Given the location of the subject project, there is a potential for DOT's highway facilities (Ala Moana Boulevard) to be impacted. DOT offers the following comments regarding FEA/EISPN:

1. Page 37, Section 4.3.1 entitled Oahu Commercial Harbors 2020 Master Plan. "Barbers Point Harbor" is mentioned. However, since the completion of the master plan, the harbor was renamed and the proper name is now, "Kalaeloa Barbers Point Harbor."

2. Since March 2009, Kewalo Basin was no longer under the jurisdiction of DOT Harbors Division..

The DOT Highways Division is concluding its review of the subject project for impacts to State highway facilities. Upon completion of this review, DOT will provide additional comments as necessary.

DOT appreciates the opportunity to provide comments. If there are any other questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 587-2356.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

c: Gail Renard, Helber, Hastert & Fee, Planners

Helber Hastert & Fee
Planners, Inc.

September 20, 2010

Mr. Brennon T. Morioka, Ph.D., P.E.
Director
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Dr. Morioka,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice and providing comments in your letters dated May 6, 2010 (Ref. STP 8.0096) and June 22, 2010 (STP 8.0141). We offer the following responses.

<u>May 6, 2010 Comments</u>

1. If it is mentioned in the Draft Environmental Impact Statement (DEIS), the harbor name "Kalaeloa Barbers Point Harbor" will be used instead of "Barbers Point Harbor."
2. Section 1.3, Page 6 indicates that jurisdiction of the harbor was transferred from State DOT Harbors Division to HCDA in March 2009. This information will be repeated in the DEIS.

<u>June 22, 2010 Comments</u>

1 and 2 The DEIS will estimate the additional vehicle trips associated with the project and their likely impacts to Ala Moana Boulevard at the end of the first phase and at full build-out. The DEIS will also discuss mitigation measures, if any are recommended based on the project's anticipated impacts.

3. The DEIS will describe the vehicular access points from Ala Moana Boulevard to Kewalo Basin harbor and Kewalo Basin Park and indicate their location in an exhibit. The DEIS will also describe observations of existing conditions at the major access points during a.m. and p.m. peak hours.

4 and 5 The DEIS will include a discussion of existing and planned parking to serve the harbor and its proposed improvements. Exhibits showing the locations of the existing and planned parking areas will be included in the DEIS.

6. The DEIS will address the project's anticipated impacts on motor vehicle traffic, bicyclists and pedestrians on Ala Moana Boulevard. If mitigation is warranted by the project's impacts, it will be included in the DEIS.

7. We note your comment that the project will require permits for work in the State highway right-of-way (ROW) and for oversize and overweight vehicles. We also note your comments that plans for construction in the State highway ROW must be submitted for review and approval by your department, and that all improvements in the State highway ROW must be planned, designed and constructed to AASHTO standards at no cost to your department.

8. We note that no additional stormwater runoff will be permitted in the State highway ROW. The project is not expected to generate additional stormwater runoff within the State highway ROW.

We appreciate your input and participation in the EIS process. As you requested, we will provide your department with four copies of the DEIS (one paper copy and three on CD-ROM) and two paper copies of the project's traffic assessment. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD10/4830B

April 22, 2010

Anthony Ching, Executive Director
Hawai'i Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Re: Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Kewalo, O'ahu

Aloha e Anthony Ching,

The Office of Hawaiian Affairs (OHA) is in receipt of an April 6, 2010 letter from your consultant, Helber, Hastert and Fee requesting comments on the Environmental Impact Statement Preparation Notice (EISPN) for the proposed Kewalo Basin Repairs Project (project). It is our understanding that the repair and/or replacement of wharf infrastructure within Kewalo Basin, including fixed piers, supporting piles, dockside utilities and bulkheads is proposed. The demolition of all submerged structures within Kewalo Basin is included within the proposed scope of work.

While we recognize the need for this proposed project, we do seek assurances that the wide range of community activities supported by the adjacent Kewalo Basin Park will not be adversely impacted by project activities. OHA advocates that community groups in the area be consulted and their concerns afforded full consideration as you move forward with the EIS process and eventually, the design and construction phases of the project.

Should this project move forward, we seek assurances that best management practices (BMPs) will be implemented and employed for the duration of project activities to protect marine water quality and resources.

We look forward to the opportunity to review the draft EIS and provide additional comments at that time. Should you have any questions, please contact Keola Lindsey, at (808) 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

C: Gail Renard
Helber Hastert & Fee, Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Clyde Nāmu'o, Chief Executive Director
State of Hawai'i
Office of Hawaiian Affairs
711 Kapi'olani Boulevard, Suite 500
Honolulu, HI 96813

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Nāmu'o,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated April 22, 2010 (No. HRD10/4830B). We offer the following responses.

1. The Draft EIS will include an assessment of potential impacts to recreational uses, including those at Kewalo Basin Park. Many community groups and organizations were provided the EISPN (see EISPN Chapter 8.0) and additional groups will be consulted during the Draft EIS preparation.
2. The EIS will identify typical or likely best management practices (BMPs) to be employed during construction activities to protect marine water quality and resources. Specific BMPs will be identified in consultation with federal regulatory agencies during the Department of Army permitting process.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

13394
212.1

UNIVERSITY of HAWAI'I® SYSTEM

Office of Capital Improvements

April 13, 2010

RECEIVED
2010 APR 16 PM 12 21
HAWAII COMMUNITY DEVELOPMENT AUTHORITY

Mr. Anthony Ching, Executive Director
Hawai'i Community Development Authority
461 Cooke Street
Honolulu, Hawai'i 96813

RE: Final Environmental Assessment/Environmental Impact Statement Preparation Notice (EISPN)
Kewalo Basin Repairs Project

Dear Mr. Ching,

Thank you for the opportunity to provide comments for the subject project. The proposed project does not impact any of the University's existing facilities, and we have no comments to offer at this time.

If you have any questions please call me at 956-7935.

Sincerely,

Brian Minaai
Associate Vice President for Capital Improvements

c: Helber Hastert & Fee

1960 East West Road, Biomedical Sciences B-102
Honolulu, Hawai'i 96822
Telephone: (808) 956-7935
Fax: (808) 956-3175
An Equal Opportunity/Affirmative Action Institution

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Brian Minaai
Associate Vice President for Capital Improvements
University of Hawai‘i
Office of Capital Improvements
1960 East West Road, Biomedical Sciences B-102
Honolulu, HI 96822

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O‘ahu, Hawai‘i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Minaai,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing your letter dated April 13, 2010. We note that the proposed project does not impact any of the University's existing facilities and that you do not have any comments on the project at this time.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

April 16, 2010

Mr. Scott Ezer
Helber Hastert & Fee
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

Subject: Your Letter Dated April 6, 2010 Requesting Comment on the Draft Environmental Impact Preparation Notice (EISPN) for Kewalo Basin Repairs Project, TMK: 2-1-58-1, 2, 35, 95

Thank you for the opportunity to comment on the proposed EISPN for Kewalo Basin.

The existing water system is presently adequate to accommodate the proposed development. However, please be advised that this information is based upon current data and, therefore, the Board of Water Supply reserves the right to change any position or information stated herein up until the final approval of your building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission and daily storage.

The proposed project is subject to Board of Water Supply Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the Building Permit Applications.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

PAUL S. KIKUCHI
Chief Financial Officer
Customer Care Division

cc: Mr. Anthony Ching, Hawaii Community Development Authority

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Paul Kikuchi, Chief Financial Officer
Customer Care Division
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, HI 96813

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, Oʻahu, Hawaiʻi
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Kikuchi,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice and providing comments in your letter dated April 16, 2010. We offer the following responses.

1. We note your comment that the existing water system is adequate to accommodate the proposed development, but that the final decision on the availability of water will be confirmed at the project's building permit stage.
2. We note that the applicant will be required to pay BWS's Water System Facility Charges.
3. We note that the project is subject to BWS's Water Supply Cross-Connection Control and Backflow Prevention requirements prior to the issuance of building permit applications.

Your comments will be included in the Draft EIS and forwarded to the project proponent and designers for their information and action.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

MUFI HANNEMANN
MAYOR

CRAIG I. NISHIMURA, P.E.
DIRECTOR

COLLINS D. LAM, P.E.
DEPUTY DIRECTOR

RECEIVED
MAY - 7 2010
HELBER, HASTERT & FEE PLANNERS

May 6, 2010

Mr. Scott Ezer
Vice President
HELBER, HASTERT AND FEE, PLANNERS
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

Subject: Final Environmental Assessment/ Environmental Impact Statement Preparation Notice (EISPN) Kewalo Basin Repairs Project Kona District, Island of Oahu (Honolulu Judicial District) TMK (1) 2-1-058: pors. 001,002, 035, 095

Thank you for inviting us to review the Final Environmental Assessment/ Environmental Preparation Notice (EISPN).

The Department of Design and Construction does not have any comments to offer at this time.

Should you have any questions, please contact me at 768-8480.

Very truly yours,

Craig I. Nishimura, P.E.
Director

CN:pg(361025)

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Craig I. Nishimura, P.E., Director
City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, HI 96813

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, Oʻahu, Hawaiʻi
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Nishimura,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing your letter dated May 6, 2010. We note that you do not have any comments on the project at this time.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 309 • KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3003 • FAX: (808) 768-3053 • CITY WEB SITE: www.honolulu.gov

MUFI HANNEMANN
MAYOR

LESTER K. C. CHANG
DIRECTOR

RICHARD HARU
DEPUTY DIRECTOR

April 16, 2010

RECEIVED
APR 20 2010
HELBER, HASTERT & FEE
PLANNERS

Mr. Anthony Ching, Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Dear Mr. Ching:

Subject: Kewalo Basin Repairs Project
Final Environmental Assessment/Environmental
Impact Statement (EISPN)

Thank you for the opportunity to review and comment on the Final Environmental Assessment/Environmental Impact Statement for the Kewalo Basin Repairs Project.

The Department of Parks and Recreation has no comment as the proposed project will not impact any program or facility of the department. You may remove us as a consulted party to the balance of the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

LESTER K. C. CHANG
Director

LKCC:jr
(360945)

cc: Gail Renard, Helber Hastert & Fee, Planners

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Lester K.C. Chang, Director
City and County of Honolulu
Department of Parks and Recreation
1000 Uluohia Street, Suite 309
Kapolei, HI 96707

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, Oʻahu, Hawaiʻi
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Chang,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing your letter dated April 16, 2010. We note that you have no comments as the proposed project will not impact any program or facility of your department. As you requested, the Department of Parks and Recreation will be removed as a consulted party for the balance of the EIS review.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE YOSHIOKA
DIRECTOR

SHARON ANN THOM
DEPUTY DIRECTOR

TP4/10-361077R

May 4, 2010

RECEIVED
MAY - 6 2010
HELBER, HASTERT & FEE
PLANNERS

Ms. Gail Renard
Helber Hastert & Fee, Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Ms. Renard:

Subject: Kewalo Basin Repairs Project

This responds to your April 6, 2010, letter requesting consultation and comments on a Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA/EISPN) for the subject project.

This project may affect bus routes, bus stops, and paratransit operations. The EIS should include a paragraph that states: "The Contractor will notify the Department of Transportation Services, Public Transit Division at 768-8396 and Oahu Transit Services, Inc. (bus operations: 848-4578 or 848-6016 and paratransit operations: 454-5041 or 454-5020) of the scope of work, location, proposed closure of any street, traffic lane, sidewalk, or bus stop and duration of project at least two weeks prior to construction."

Thank you for the opportunity to review this matter. Our department reserves further comment on the project until the release of the traffic impact study being prepared for the EIS. Should you have any further questions on the matter, you may contact Mr. Brian Suzuki of my staff at 768-8349.

Very truly yours,

WAYNE Y. YOSHIOKA
Director

cc: Mr. Anthony Ching, HCDA

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Wayne Y. Yoshioka, Director
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, HI 96813

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, Oʻahu, Hawaiʻi
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Yoshioka,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated May 4, 2010 (Ref. TP4/10-361077R). We offer the following responses.

The Draft EIS will note your comment that the project may affect bus routes, bus stops, and paratransit operations. The EIS will include a statement similar to the following: "The construction contractor will notify the Department of Transportation Services, Public Transit Division and Oʻahu Transit Services, Inc. of the scope of work, location, proposed closure of any street, traffic lane, sidewalk, or bus stop and duration of project at least two weeks prior to construction."

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

HONOLULU FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ROLLAND J. HARVEST
DEPUTY FIRE CHIEF

April 26, 2010

Mr. Scott Ezer, Vice President
Helber Hastert & Fee Planners, Inc.
Pacific Guardian Center
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Mr. Ezer:

Subject: Final Environmental Assessment
Environmental Impact Statement Preparation Notice
Kewalo Basin Repairs Project

In response to your letter of April 6, 2010, regarding the above-mentioned subject, the Honolulu Fire Department (HFD) reviewed the material provided and requires that the following be complied with:

1. Provide a fire apparatus access road for every facility, building, or portion of a building hereafter constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet (45 720 mm) from a fire apparatus access road as measured by an approved route around the exterior of the building or facility. (1997 Uniform Fire Code, Section 902.2.1.)

2. Provide a water supply, approved by the county, capable of supplying the required fire flow for fire protection to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed or moved into or within the county.

   On-site fire hydrants and mains capable of supplying the required fire flow shall be provided when any portion of the facility or building is in excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the

Mr. Scott Ezer, Vice President
Page 2
April 26, 2010

exterior of the facility or building. (1997 Uniform Fire Code, Section 903.2, as amended.)

3. Submit civil drawings to the HFD for review and approval.

Should you have any questions, please call Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/SY:bh

cc: Anthony Ching, Hawaii Community Development Authority

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Kenneth G. Silva, Fire Chief
City and County of Honolulu
Honolulu Fire Department
636 South Street
Honolulu, HI 96813-5007

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Chief Silva,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated April 26, 2010. We offer the following responses.

Comment 1: "Provide a fire apparatus access road for every facility, building, or portion of a building hereafter constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet (45 720 mm) from a fire apparatus access road as measured by an approved route around the exterior of the building or facility (1997 Uniform Fire Code, Section 902.2.1)."

Response: *The Draft EIS will state that the perimeter of the site is accessible to fire trucks, but the docks are not and will be fitted with fire protection apparatus.*

Comment 2: "Provide a water supply, approved by the county, capable of supplying the required fire flow for fire protection to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed or moved into or within the county.

On-site fire hydrants and mains capable of supplying the required fire flow shall be provided when any portion of the facility or building is in excess of 150 feet (45,720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building (1997 Uniform Fire Code, Section 903.2, as amended)."

Response: *The Draft EIS will state that fire suppression service will be provided to serve the new docks. The second paragraph is not applicable to the proposed pier improvements.*

Comment 3: "Submit civil drawings to the HFD for review and approval."

Response: *The Draft EIS will include this discussion.*

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

MUFI HANNEMANN
MAYOR

LOUIS M. KEALOHA
CHIEF

DELBERT T. TATSUYAMA
RANDAL K. MACADANGDANG
DEPUTY CHIEFS

OUR REFERENCE DAT-DK

April 27, 2010

RECEIVED
APR 30 2010
HELBER, HASTERT & FEE PLANNERS

Mr. Anthony Ching, Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, Hawaii 96813

Dear Mr. Ching:

This is in response to a letter from Helber, Hastert & Fee Planners, Inc. (HHFP), requesting comments on a Final Environmental Assessment/Environmental Impact Statement Preparation Notice for the Kewalo Basin Repairs project.

This project may have a negative impact on calls for police services in the area because of noise and traffic complaints during its construction.

If there are any questions, please call Major Saito of District 1 (Honolulu) at 529-3386.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By
DEBORA A. TANDAL
Assistant Chief of Police
Support Services Bureau

cc: Ms. Gail Renard, HHFP

Serving and Protecting With Aloha

Helber Hastert & Fee
Planners, Inc.

April 6, 2010

Dear Participant:

Attached for your review is a Final Environmental Assessment/Environmental Impact Statement Preparation Notice (EISPN), which was prepared pursuant to the EIS law (Hawaii Revised Statutes, Chapter 343) and the EIS rules (Administrative Rules, Title 11, Chapter 200).

Name of Project:	Kewalo Basin Repairs Project
Island and District:	Kona District, Island of O'ahu (Honolulu Judicial District)
Tax Map Key:	(1) 2-1-058: pors. 001, 002, 035, 095
Proposing Agency:	Hawai'i Community Development Authority
Address:	461 Cooke Street Honolulu, HI 96813 Mr. Anthony Ching, Executive Director Phone: (808) 594-0300
Accepting Authority:	Governor, State of Hawai'i
Address:	c/o Hawai'i Community Development Authority 461 Cooke Street Honolulu, HI 96813 Mr. Anthony Ching, Executive Director Phone: (808) 594-0300
Consultant:	Helber Hastert & Fee, Planners
Address:	733 Bishop Street, Suite 2590, Honolulu, HI 96813
Contact:	Gail Renard Phone: (808) 545-2055 email: grenard@hhf.com

Please send comments to the **Proposing Agency and Consultant**.

Comments must be received or postmarked by: **May 8, 2010**

Thank you for your participation in the EIS process. We look forward to receiving your comments, questions, and suggestions.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

Enclosure

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Louis M. Kealoha, Chief of Police
City and County of Honolulu
Police Department
801 South Beretania Street
Honolulu, HI 96813

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Chief Kealoha,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter dated April 27, 2010 (Ref. DAT-DK). We offer the following responses.

The Draft EIS will note that the project may have an adverse impact on calls for police services during the construction period due to increased levels of noise and traffic. The construction contractor will comply with State Department of Health requirements concerning construction noise, and will coordinate construction activities with the State Department of Transportation and City and County of Honolulu Department of Transportation Services regarding any proposed closure of any street, traffic lane, sidewalk, or bus stop.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

Hawaiian Telcom

RECEIVED
APR 15 2010
HELBER, HASTERT & FEE PLANNERS

April 13, 2010

Hawaii Community Development Authority
461 Cooke Street
Honolulu, HI 96813
Attention: Mr. Anthony Ching, Executive Officer

Dear Mr. Ching:

Subject: **Kewalo Basin Repairs Project**
Final Environmental Assessment/Environmental Impact Statement Preparation Notice (EISPN)

Thank you for the opportunity to review and comment on the subject project.

Hawaiian Telcom does not have any comments to offer at this time. Please continue to include us during the design stages of the project.

If you have any questions or require assistance in the future on this project, please call Les Loo at 546-7761.

Sincerely,

Lynette Yoshida
Senior Manager - OSP Engineering
Network Engineering & Planning

cc: Gail Renard - Helber Hastert & Fee, Planners
File [Kakaako]

PO Box 2200 • Honolulu • Hi 96841

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Ms. Lynette Yoshida
Senior Manager – OSP Engineering
Network Engineering and Planning
Hawaiian Telcom
P.O. Box 2200
Honolulu, HI 96841

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Ms. Yoshida,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing your letter dated April 13, 2010. We note that Hawaiian Telcom does not have comments at this time. The project proponent (Hawai'i Community Development Authority) will coordinate with your utility during the project design stages.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Pacific Guardian Center • 733 Bishop Street, Suite 2590 • Honolulu, Hawaii 96813
Tel. 808.545.2055 • Fax 808.545.2050 • www.hhf.com • e-mail: info@hhf.com

REGARDING SECTION 5.3.2, LARGE EXCURSION VESSEL BERTH
of the EISPN for the Kewalo Basin Repairs Project

As usual, the research to write this section was skewed to support the department's viewpoint, not the actual facts as they exist. The STAR of HONOLULU, a 1500 passenger, 234' X 45', tour and dinner cruise vessel, ran very successfully from Kewalo Basin for seven years using the dock in front of the marine repair facility's parking lot as a berth. The necessary vehicles to service the vessel operated along Ahui street for both drop off and pickup without incident. At that time the atmosphere of the neighborhood was the City and County's trash truck operation on the ewa side of Ahui Street and the fish auction's dumpster immediately beside the offloading area for the vessel's berth. This made it's relocation to Honolulu harbor, alongside Aloha Tower Marketplace most desirable when the Marketplace opened for business.

If you look at the planned slips along the Fisherman's Wharf area you will see that the plan shows 36 forty foot slips, two 80 foot side ties and 12 thirty five foot slips. Using the departments fee schedule this would bring in an annual income of $141,043.20 if all slips were occupied with commercial fishing boats, or if they were all occupied by commercial tour or private boats they would bring in $280,008.00 per year. An average of the two gives us a probable income of $210,525.60 per year after the investment to build and maintain all of those berths.

To accommodate a vessel similar to the STAR of HONOLULU alongside at the existing Fisherman's Wharf pier requires only the refurbishing of the fendering system along the existing pier, installation of a sewer pressure main to the pier edge to facilitate the ship's pumpout operation (which it had at the previous berth by the marine repair facility) and provision for the ship to connect to 480 volt three phase 300 amp electrical service. For this the ship would pay about the same amount the STAR presently pays to Honolulu Harbor, namely $303,000.00 per year for 2009. It would also bring it's approximately 550,000 passengers each year into contact with the merchants and commercial offerings in the Basin area. There is approximately 600' of alongside space available at the pier so it is possible to accommodate more than one large tour vessel or a combination of other vessels which would result in even more revenue, all without building more berths.

The STAR of HONOLULU was designed and built to operate in confined space and can turn in her own length. She never had a traffic problem during all of the seven years that she operated from the pier in front of the marine repair facility. There is ample turning room for her in the basin when the two proposed piers jutting from the Fisherman's Wharf are not constructed. The remaining proposed new 80 foot finger pier just mauka of the haulout facility is not a problem to the maneuvering abilities of a vessel like the STAR.

A large tour vessel will require access for vehicles to come in from Ahui Street at the mauka side of the haulout facility and then pass up the face of the Fisherman"s Wharf pier to drop off or pickup at the ship and then proceed out onto Ala Moana Blvd. This same access is required to serve any vessel moored along side there as they all need fuel, stores and services in addition to passenger access. I suggest you observe the similar operations serving the STAR of HONOLULU now at Aloha Tower Marketplace each evening beginning at about 1630 for the loading operation and again at about 1930 for the offload operation. The ship can also be made available for a demonstration run into Kewalo Basin to show the space required to make the turnaround which would be required on each departure from the berth should this be of help to non marine design engineers working on the project. Passing in the entrance channel has never been a problem except in very heavy kona weather and then not any of the boats in the basin try to use the channel at the same time with each other. During heavy kona weather, most tour boats try to get permission to operate temporarily from Honolulu Harbor if space is available. This means that an MOU between the two harbors controlling agencies will have to be worked out in advance or this is not a possible venture for any large tour vessel. When both harbors were under the jurisdiction of DOT Harbors, this was not a problem, and with an MOU in place, it can be workable again.

By the way, overlooked in the department's statement and also by whoever prepared the Oahu Commercial Harbors 2020 Master Plan is the fact that for many years a much larger, refrigerated cargo vessel regularly called at Kewalo basin to serve the Bumble Bee Cannery that was located between Fisherman's Wharf and the marine repair facility for about forty years. It used this same Fisherman's Wharf pier. The entry and departure of this vessel did require all other harbor operations to stop for about 30 minutes, but it usually came and went about mid day and so inconvenienced almost none of the rest of us as the fishing boats usually departed early and returned late and most of the tour boats usually got underway about dinner time.

I hope you will consider this very simple option to bring immediate revenue into the harbor, increase the exposure to people for the retail and commercial operations here and increase the variety of offerings to attract people to the area, all without the added expense of building the 52 additional berths.

Sincerely,

Reg White
Captain, USMS
vp project development, Paradise Cruise, Ltd.
1540 S. King St.
Honolulu, HI 96826-1919
(808) 222-9794
RawcoHI@cs.com

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Reg White
Captain, USMS
VP Project Development, Paradise Cruise, Ltd.
1540 South King Street
Honolulu, HI 96826-1919

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. White,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your letter that we received on April 19, 2010. We offer the following responses.

We appreciate the additional information on the large excursion vessel alternative. We have reviewed the additional information on the alternative with the Hawai'i Community Development Authority (HCDA), the project owner. This alternative will continue to be described in the Draft EIS and its potential environmental impacts will be qualitatively addressed in the "Alternatives Considered" section.

Comparative Revenues

There are several factors that HCDA must consider in determining the mix of users upon which it bases its harbor improvement planning and programming; revenue is one factor. We have not conducted an analysis of the comparative revenues that could be expected from different vessel types. However, revenues collected must be weighed against capital and operating expenditures related to the large vessel. For example, according to the project engineers, the existing Fisherman's Wharf pier structure may require extensive structural rehabilitation to accommodate a large vessel such as the STAR of HONOLULU ("STAR") and the added deck loads associated with its operations. A structural analysis would be needed to determine the required improvements. Furthermore, the infrastructure improvements (power, wastewater) needed to accommodate the STAR or other large vessels at that berth would be greater than those needed for smaller craft.

HCDA's primary consideration in its long-range harbor planning is to accommodate existing harbor users and to take into consideration future demand of similar vessels,

and not necessarily to generate the highest overall revenue. As stated in the EISPN, the proposed action is intended to meet the following objectives:

- provide modernized berthing and mooring infrastructure and supporting pier-side utilities in Kewalo Basin harbor;
- accommodate existing harbor users, including commercial fishing and excursion enterprises; and
- optimize berthing and mooring capacity of harbor.

The STAR or vessel of similar size and passenger capacity is not a current harbor user and there are no current plans for introduction or relocation of such a vessel to the harbor. Therefore, for purposes of the EIS analysis, it is not considered a "reasonable alternative."

Turning Room

Thank you for pointing out the maneuvering ability of the STAR. We will revise the discussion to note the STAR's maneuverability. The discussion will also note that while the STAR is more maneuverable than other vessels of its size, if it were to experience a mechanical failure of its thrusters, the vessel may block ingress/egress to the harbor and have a negative impact on navigation.

Land-Side Support

Thank you for your thoughts on a vehicle circulation plan to serve the STAR, if it were to be berthed at Fisherman's Wharf. Your letter notes that the STAR never had a traffic problem during the time it operated at the Honolulu Marine wharf. However, traffic conditions along Ala Moana Boulevard have undoubtedly changed in the interim, particularly the Ward Avenue/Ilalo Street intersection with Ala Moana Boulevard where 'ewa-bound buses from Waikiki would be turning during the PM peak hour (to shuttle passengers to Fisherman's Wharf).

As you are aware, development of the Kaka'ako Makai Area is governed by HCDA's Makai Area Rules. The Rules require the development of a Cultural/Public Market in Kaka'ako Makai. Although the Makai Area Rules do not specify a particular location for the Cultural/Public Market, any site along the waterfront should be considered a potential site, including the Fisherman's Wharf area. If located there, the Cultural/Public Market would obviate the availability of the area for STAR passenger staging. A feasibility study to determine the extent of the necessary passenger staging/security standoff area is beyond the scope of this EIS.

In summary, the EIS will address the full buildout scenario of the preferred alternative, which accommodates existing users and vessels similar to those currently using the harbor. While it may be possible for the STAR (or similar large excursion vessel) to be accommodated alongside the Fisherman's Wharf area, a feasibility study is needed to determine the extent of pier- and land-side improvements that would be required. This is beyond the scope of this EIS, as a vessel of this size and passenger capacity—its previous berthing at a different wharf in Kewalo Basin notwithstanding—is not a current harbor user and there are no current plans for introduction or relocation of such a vessel to the harbor. In the future, if a large excursion vessel is proposed for berthing in Kewalo Basin that requires improvements that are not covered in the EIS currently being prepared, a separate HRS Chapter 343 environmental document may be required.

We appreciate your input and participation in the EIS process. Your letter and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

May 4, 2010

From: Hawaii Longline Association
To: Herbert Haster & Fee, Planners
E-mail: grenard@hhf.com

Re: Kewalo Basin Project

To whom it may concern,

Kewalo Basin Harbor was originally built to accommodate commercial fishing, tour and excursion vessels. The Hawaii Longline Association (HLA) believes the harbor purposes should remain as such. The proposed project doesn't seem to accommodate longline fishing vessels in adequate numbers.

HLA has informed you that the number of longline vessels that regularly berthing in Kewalo would be between 20 and 25 vessels. The average length of the vessels would be 70'.

After reviewing your Conceptual Building Plan it calls for the following slips:

- Pier C - 2 @ 60' & 1@ 120'
- Pier B - 2 @ 50' & 1@ 100'
- Pier A – 2@ 50' & 1@ 100'
- Loading Dock 2 @ 80'
- Makai Wharf 2 @ 80' & 5 @ 80'

We request 7 more slips of 65' to 80' in length at a minimum.

Thank you for your consideration.

Tom Hahn
Hawaii Longline Association Director 382-9537

Helber Hastert & Fee
Planners, Inc.

October 4, 2010

Mr. Tom Hahn, Director
Hawai'i Longline Association
2238 Seaview Drive
Honolulu, HI 96822

Kewalo Basin Repairs Project
Environmental Impact Statement Preparation Notice
Honolulu, O'ahu, Hawai'i
TMK (1) 2-1-058: pors. 001, 002, 035, 095

Dear Mr. Hahn,

Thank you for reviewing the subject Environmental Impact Statement Preparation Notice (EISPN) and providing comments in your email message dated May 4, 2010. We offer the following responses.

We note your comment that between 20 and 25 longline vessels with an average length of 70 feet regularly berth in Kewalo Basin, and that you request 7 more slips of 65 to 80 feet be included in the buildout plan.

We agree with your interpretation of the Conceptual Buildout Plan (Figure 4 of the EISPN) as including two 80-foot berths at the Diamond Head ends of the finger piers extending from the Fisherman's Wharf loading dock and a total of seven 80-foot berths at the Makai Wharf. However, we invite you to review the Plan more closely, as it indicates that a reconstructed Pier C could accommodate 22 slips at 65 feet along its length, as well as either two 60-foot berths or one 120-foot berth at the 'ewa end. The Conceptual Buildout Plan also indicates that both Piers A and B could accommodate either two 50-foot berths or one 100-foot berth at their 'ewa ends. Therefore, the existing Conceptual Buildout Plan includes 31 berths of 65 feet or longer (7 at Makai Wharf, 22 at Pier C, 2 at Fisherman's Wharf). The Plan also shows the potential for three additional berths of 100-120 feet at the ends of Piers A, B, and C.

We appreciate your input and participation in the EIS process. Your email message and this response will be included in the Draft EIS.

Sincerely,

HELBER, HASTERT AND FEE, PLANNERS

Scott Ezer
Vice President

cc: Mr. Anthony Ching, HCDA
Mr. Deepak Neupane, HCDA (via email)
Mr. Neal Imada, HCDA (via email)
Mr. Victor Szabo, Moffatt & Nichol (via email)
Mr. Dean Kokubun, Moffatt & Nichol (via email)

Cover photo courtesy of Almar Management

APPENDICES

Cover photo courtesy of Almar Management

A

Baseline Assessment of Water, Sediment and Biotic Composition

BASELINE ASSESSMENT OF WATER, SEDIMENT AND BIOTIC COMPOSITION IN KEWALO BASIN, O‘AHU, HAWAI‘I

Prepared for:

Helber, Hastert & Fee, Planners
733 Bishop St., Suite 2590
Honolulu, HI 96813

By:

Marine Research Consultants, Inc.
1039 Waakaua Pl.
Honolulu, HI 96822

July 2010

I. INTRODUCTION

Kewalo Basin is a mixed-use harbor consisting of 143 boat slips occupied by commercial boats (fishing and excursion) and pleasure craft. It has historically been an instrumental part of the Honolulu waterfront, serving as a small boat commercial harbor for intra-state commercial activities supplementing the inter-state commerce of larger harbors administered by the State of Hawai‘i Department of Transportation (SDOT) Harbors Division. Previously controlled by the SDOT Harbors Division, Kewalo Basin and the surrounding State-owned fastlands were transferred to the Hawai‘i Community Development Authority (HCDA) by Act 86 in 1990, and jurisdiction of the harbor was transferred on March 1, 2009. The harbor's submerged lands are now managed by Almar Management under contract to HCDA. The various piers and docks in Kewalo Basin were constructed incrementally over many decades, and most of the structures have been repaired, renovated and/or demolished and replaced since their original construction. Consequently, the existing structures range in age from approximately 12 to 15 years (catwalk piers on the ‘Ewa side of the Mauka Wharf reconstructed in the late 1990's) to nearly 50 years (the finger piers on the Diamond Head side of the Mauka Wharf). Based on the results of a 2007 condition study commissioned by HCDA of selected structures within the harbor, there appears to be extensive deterioration of the structures' topside elements, primarily by corrosion damage on the undersides of the pier decks.

Owing to the deteriorated condition of the pier decks and other facilities within the harbor, HCDA proposes to repair or replace the existing harbor infrastructure.

The proposed action involves demolition and removal of all existing submerged structures, including Piers A, B, C and D (“Herringbone Pier”), the Front Row (Mauka Wharf) commercial vessel slips adjacent to Ala Moana Boulevard, and the Makai Wharf slips. The full build-out redevelopment concept for Kewalo Basin increases moorage densities within the harbor, provides modernized amenities to boaters, improves operational efficiencies within the basin, and better integrates the berthing and mooring facilities with shore-side utilities and infrastructure.

The proposed project includes the following key features:

- 250 slips ranging in dedicated lengths from 35 feet (ft.) to 120 ft., with a total length of moorage of approximately 13,100 ft. The structures represent an aerial coverage of 75,800 square feet (sq. ft.), or about 7.7% of the harbor footprint;
- Replacement of Piers A, B and C with longer piers to compensate for the removal of the Herringbone Pier (Pier D);
- Reconstruction of the Front Row (Mauka Wharf) slips with reconfigured lengths and widths to optimize their usability and the capacity of the harbor;
- Construction of a longitudinal berth adjacent to the Makai Wharf;
- Construction of two new finger piers for small- to medium-sized commercial vessels extending from the Fisherman’s Wharf loading dock;
- Construction of a single jetty pier at the *makai* end of the Fisherman’s Wharf loading dock;
- Construction of a fueling dock pier, extending ‘Ewa of the existing *makai* loading dock;
- Construction of a dedicated marine maintenance dock adjacent to the current Honolulu Marine Kewalo Shipyard facility;
- Maintenance and/or upgrade of the existing boat haul-out facility *mauka* of the current Honolulu Marine Kewalo Shipyard facility;
- Modernization of the water and electric utilities that service the new slips. Proposed improvements include increasing the power to some of the larger slips from typical 30 ampere (amp) outlets, to 50/100/dual 100 amp service;
- Provide septic handling systems at the improved facility for the disposal of onboard septic waste directly into the municipal sanitary system. This may include a dock-based, mechanical pump-out station; and

- Provide water supply and fire-fighting capabilities at the improved facility. The new piers will either be fixed or floating; this will be determined in the upcoming design phase. Both fixed and floating piers will require the demolition of existing supporting piles and the installation of new piles. The number of new piles required will be determined by the type of piers (fixed or floating) constructed.

As part of this planning process, a preliminary baseline assessment of water quality, sediment quality and biotic community composition was conducted in April 2010. The assessment consisted of a qualitative assessment of marine biota in the area that might be affected by re-building the docks, as well as a quantitative general assessment of water quality including measurements of all constituents listed in the State of Hawai'i Department of Health (DOH) Water Quality Standards for estuarine waters. Sediment samples were analyzed for a suite of constituents to evaluate the presence of contaminants. Presented below are the methods and results of the baseline assessment.

II. METHODS

Water quality was evaluated at nineteen stations within Kewalo Basin extending through the entrance channel and into the coastal ocean (Figure 1). Samples were collected at two depths at each sampling station; a surface sample was collected within approximately 10 centimeters (cm) of the sea surface, and a bottom sample was collected within 50 cm of the harbor floor.

Water quality parameters evaluated included all of the specific criteria designated for estuaries in Chapter 11-54, Section 06 (Embayments) of the DOH Water Quality Standards. These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO_3^- + NO_2-, hereafter referred to as NO_3^-), ammonium nitrogen (NH_4^+), total phosphorus (TP), chlorophyll a (Chl *a*), turbidity, pH, salinity and temperature. In addition, orthophosphate phosphorus (PO_4^{3-}) and silica (Si) were also reported because these parameters are sensitive indicators of biological activity and the degree of groundwater or surface water mixing.

Field collection of water samples was conducted on February 23, 2010 between the hours of 09:00 and 10:30 am during which the rising tide reached a high of +0.8 feet. Prevailing weather conditions consisted of sunny skies and moderate tradewinds (15-20 knots). All samples were collected from a small boat using a Niskin-type oceanographic sampling bottle. The bottle is lowered to the desired sampling depth with spring-loaded endcaps held open so water can pass freely through the bottle. At the desired sampling depth, a weighted messenger released from the surface triggers closure of the endcaps, isolating a volume of water. Upon retrieval, water from the Niskin bottle was poured into 1-liter triple-rinsed polyethylene bottles.

Following collection, subsamples for nutrient analyses were immediately placed in 125-milliliter (ml) acid washed, triple rinsed, polyethylene bottles and stored on ice. Analyses for NH_4^+, PO_4^{3-} , and NO_3^- were performed with a Technicon autoanalyzer using standard methods for seawater analysis (Strickland and Parsons 1968, Grasshoff 1983). TN and TP were analyzed in a similar fashion following oxidative digestion. Total organic nitrogen (TON) and total organic phosphorus (TOP) were calculated as the difference between TN and dissolved inorganic nitrogen (N) and TP and dissolved inorganic phosphorus (P), respectively.

Water for other analyses was subsampled from 1-liter polyethylene bottles and kept chilled until analysis. Chl *a* was measured by filtering 300 ml of water through glass fiber filters; pigments on filters were extracted in 90% acetone in the dark at 20° C for 12-24 hours. Fluorescence before and after acidification of the extract was measured with a Turner Designs fluorometer. Salinity was determined using an AGE Model 2100 laboratory salinometer with a readability of 0.0001‰ (ppt). Turbidity was determined on 60 ml subsamples using a Monitek Model 21 nephelometer, and reported in nephelometric turbidity units (NTU). pH was measured on a laboratory meter with readability of 0.001 pH units.

In situ field measurements of water temperature, dissolved oxygen and salinity were acquired using an RBR Model XR-620 CTD calibrated to factory specifications. The CTD has a readability of 0.001°C, 0.001% saturation, and 0.001 parts per thousand (salinity).

All laboratory analyses were conducted by Marine Analytical Specialists in Honolulu, Hawai‘i. Marine Analytical Specialists possesses the acceptable rating for EPA-compliant proficiency and quality control testing.

Sediment samples were collected at three representative, but random sites within the inner areas of Kewalo Basin. Sediment samples were collected by divers using acid-washed glass jars that were cored into the sediment surface and capped in-situ. On return to the boat, sediment samples were immediately placed on ice. Samples were shipped to the analytical lab (Associated Laboratories) located in Orange, California on the day following collection. Chemical analysis included conventional tests for pH, percent solids, ignitability, total organic carbon (TOC), total and water-soluble sulfides, oil and grease, total recoverable petroleum hydrocarbons (TRPH), and cyanides. Other parameters tested included total metals, toxicity characteristic leaching procedure (TCLP) metals, pesticides, polychlorinated biphenyls (PCBs), semi-volatile and halogenated volatile organic compounds, total petroleum hydrocarbons (TPH), and benzene, toluene, ethylbenzene, and xylene (BTEX). The tests for ignitability, TCLP metals, sulfides, cyanides, PCB and TPH are required for disposal at a permitted landfill. The analytical methods used and the target detection limits were based on dry weight.

Biotic community composition was evaluated by conducting reconnaissance swims throughout the basin. Community assemblages were recorded on writing slates and photographically. All water and sediment sampling was conducted by Dr. Steven Dollar. Biotic community structure was evaluated by S. Dollar and Dr. Richard Brock.

III. RESULTS

A. Water Chemistry

Tables 1 and 2 show results of water chemistry analyses. Table 1 shows concentrations of dissolved nutrients in micromolar (µM) units, while Table 2 shows concentrations of nutrients in units of micrograms per liter (µg/L). Figures 2-4 are histograms showing concentrations of nine water chemistry parameters at each sampling site, while Figures 5 and 6 show vertical profiles of salinity and temperature through the water column at each of the nineteen sampling stations.

Several trends are apparent in these histograms. The most evident pattern is that there are both vertical and horizontal gradients in the concentrations of the inorganic nutrients Si, NO_3^- and salinity. Vertical gradients occur with respect to the water column from the surface to the basin floor, and horizontal gradients occur with respect to distance from the shoreline. Within the main basin (Stations 1-15) the concentrations of Si and NO_3^- are consistently elevated in surface samples relative to the corresponding bottom sample. Salinity displays the opposite trend with lower values at the surface relative to bottom samples. Within and beyond the entrance channel (Stations 16-19) the vertical stratification breaks down with little difference between surface and bottom samples. In addition, surface concentrations of Si and NO_3^- are substantially elevated within the basin relative to the entrance channel (Tables1-2, Figures 2 and 5).

These patterns are likely a reflection of fresh groundwater that enters the basin through discharge at the shoreline forming a buoyant surface lens. Groundwater efflux into the basin, traced by reduced salinity in surface water, was most evident at Stations 3, 9 and 12 with salinities below 34.5‰ (Figure 4). Station 3 was located of the eastern edge of the basin, while Stations 9 and 12 were located off the northern boundary of the basin (Figure 1). As groundwater typically contains elevated concentrations of Si and NO_3^- and lower salinity relative to ocean water, the buoyant lens contains elevated concentrations of these nutrients. Inspection of Figure 2 and Table 2 reveals that the highest concentrations of surface Si and NO_3^- occur at Stations 1, 3, 9 and 12, all of which are located within the most landward portion of the basin (Figure 1). The survey was conducted during a period of prolonged dry weather. Hence there was little or no surface flow entering the basin. Had surface water draining the upland watershed been flowing into the basin, it is likely that there would be a different structure to water chemistry as surface water is generally not as enriched in Si and NO_3^- as groundwater.

Histograms of other water chemistry constituents do not reflect the same patterns as Si, NO_3^- , and salinity. While concentrations of PO_4^{3-} , TP and TN show a slight trend of diminishing values with distance from shore, there is no consistent pattern with respect to vertical profiles (Figures 2 and 3). Concentrations of NH_4^+ are generally elevated in bottom samples relative to surface samples within the basin, likely as a result of biotic respiration in the sediment column (Figure 3). Histograms of turbidity reveal relatively constant values of approximately 0.1 NTU in surface samples throughout the basin, and are only slightly higher in surface samples within the basin compared to the outer channel (Figure 4). Overall, values of turbidity are elevated in bottom samples relative to surface, which is not surprising owing to the fine-grained sediment composition of the basin floor (Figure 4). Within the basin, values of Chlorophyll a are consistently higher at the surface relative to the bottom, and decline with distance from the shoreline (Figure 4). Vertical profiles of temperature showed a similar trend, with highest values in the most inland portions of the basin and decreasing values moving seaward out the channel, and consistently higher values in surface relative to bottom samples (Figure 6).

Kewalo Basin is classified as an embayment within DOH Water Quality Standards. This classification includes three sets of specific criteria; criteria that are not to be exceeded 10% of the time; criteria not to be exceeded more than 2% of the time, and criteria that are not to be exceeded by the geometric means of samples. Comparing sample concentrations to these criteria provide an indication of whether water quality is near the stated specific criteria.

Noted in Tables 1 and 2 are samples that exceed DOH 10% water quality standards for embayments, which are defined as land-confined and physically-protected marine waters with restricted openings to open coastal waters. Kewalo Basin is considered a "Class A" embayment. The criteria for "wet" conditions are applied, as the basin probably receives more than 1% of the volume in freshwater input per day. Examination of Tables 1 and 2 reveal that the only constituents that exceeded water quality standards for the samples collected on February 23, 2010 are NO_3^- and NH_4^+. Surface samples from seven stations exceeded both the "not to exceed more than 10% of the time criteria" for NO_3^- , while three surface samples exceeded the 2% criteria. Four bottom samples exceeded the 10% criteria for NH_4^+, while one sample exceeded the 2% criteria. NO_3^- typically occurs naturally in high concentration in groundwater relative to ocean water. The presence of high concentrations of NO_3^- in surface samples (along with depressed salinities) indicates input of low salinity groundwater to Kewalo Basin. Hence, these samples might exceed DOH criteria based solely on input of naturally occurring groundwater or stream water. However, it is also likely that the concentrations of NH_4^+ and NO_3^- may be augmented by subsidies from human activities on land, particularly urban sources.

B. Sediment Chemistry

The entirety of the floor of Kewalo Basin and inner entrance channel is covered with a layer of fine-grained muddy sediment. Sediment samples cored from the surface to a depth of approximately 20 cm into the sediment column were analyzed for the set of chemical constituents routinely analyzed for permitting decisions for allowable dredge spoils disposal. All results of sediment chemistry are shown in Appendix A, while Table 3 shows concentrations of those constituents that were reported above the detection limits.

Overall, results from all three sample sites were similar, indicating that distribution of chemical constituents within the sediment is relatively homogeneous throughout the inner basin. All three samples reported no detectable TCLP metals. None of the samples contained any detectable levels of 69 volatile organic compounds, soluble or total sulfides, or reactive cyanide. Of the list of twenty organochlorine pesticides, only one (4,4-DDT) was detected in all three samples at concentrations of 0.005 to 0.013 mg/Kg (Table 3). Of nine PCBs only one (PCB-1260) was detected at all three sites at concentrations ranging from 0.05-0.09 mg/Kg (Table 3). Of the 84 acid/base/neutral extractable compounds, only one [bis(2-Ethylhexyl)phthalate] was detected at Stations 2 and 3 (Table 3).

Materials that were found in considerable quantities at all three sampling sites included Total Oil and Grease, and Total Recoverable Petroleum Hydrocarbons. Fingerprinting for petroleum indicated high levels of Motor Oil and Diesel at Stations 1 and 2, but none at Station 3. Analysis for metals by ICP/MS (inductively coupled plasma mass spectrometry) revealed detectable concentrations of arsenic, chromium, copper, lead, nickel, and zinc at all three sites. Mercury was also detected at all three sites (Table 3).

The results of sediment analysis, particularly the presence of petroleum products and metals, are what might be expected from an enclosed basin that berths motorized vessels. The overall lack of pesticides, PCBs and acid/base/neutral extractables might be considered somewhat surprising as the basin receives urban runoff.

C. Marine Community Structure

Composition of the marine communities inhabiting the manmade structures was generally similar throughout Kewalo Basin. Photographs of various forms of marine life observed within the basin and entrance channel are shown in Figures 7-16. The location of each photograph is shown in Figure 17.

The bottom of most of the basin consists of fine-grained muddy sand that was covered with a thin film of reddish-brown cyanobacteria (Figure 7). The bacterial mat was broken by holes and burrow mounds excavated by what is likely a variety of organisms including worms, shrimp and crabs. Composition of the bottom of the basin was only different along the innermost margin of the northwestern corner, where a raised bench is covered by a mix of sand and shell debris (Figure 8). The ledge also contained a variety of discarded materials such as bottles and several shopping carts (Figure 8). The concrete drainageway in the northwestern corner of the basin was devoid of most macrobenthos (Figure 9). No living stony corals were observed on any of the concrete structures or solid surfaces within Kewalo Basin.

The upper surfaces of concrete piers and pilings within the intertidal range were either bare or covered with a veneer of barnacles and oyster shells (Figure 9). The submerged pilings, as well as all other permanently submerged structures, were fully encrusted with a wide variety of fouling organisms. The predominant taxa of fouling organisms included bryozoans, sponges, hydroids, worms and algae (Figures 10-13). A complete taxonomic inventory of the myriad of fouling organisms colonizing solid submerged structures is well beyond the scope of the present report. Of particular note was the abundant stoloniferous bryozoan, *Zoobotryon verticillatum*, which has the appearance of a filamentous alga (Figure 10). It is a common cosmopolitan shallow-water species known from the southeastern United States, the Mediterranean Sea, Bermuda, California, Hawai‘i, and elsewhere. Other commonly observed bryozoans included *Hippopodina feegeenis* (Figure 10) *and Schizoporella unicornis* (Figure 11). Common sponges included the orange forms of *Mycale armata* and *Suberites zeteki* (Figures 11 and 12). The sponge *Mycale cecilia,* which occurs of white tubular projections, was very common on pilings throughout the harbor (Figure 13). The filamentous green algae *Bryopsis pennata* and ribbon-like *Ulva fasciatus* were common on the upper surfaces of pilings (Figure 12). None of the encrusting organisms are considered rare or of any commercial or subsistence importance. No reef-building corals were observed colonizing any of the solid surfaces (piers, pilings) within Kewalo Basin.

Review of the “Guidebook of Introduced Marine Species of Hawai‘i” prepared by the Bishop Museum and University of Hawai‘i (R. DeFelice, L. Eldredge and J. Carlton) (see http://www2.bishopmuseum.org/HBS/invertguide/index.htm) describe many of the more common alien marine invertebrates know in the Hawaiian Islands. These authors consider 201 species to be introduced, and 86 species area considered cryptogenic (not demonstratively native or introduced). Of the 287 species inventoried, 248 have become established, 15 arrived but failed to become established, 6 were intercepted, and the population status of 18 species is unknown. It is stated that the greatest number of introduced marine invertebrates have probably arrived to Hawai‘i through hull fouling, but many may have also arrived through solid ballast and in ballast water. Of the common introduced sponges, Cnidarians, Polycheates, Molluscs, Crustaceans, Bryozoans and Ascidians described in the publication, many are described as very common fouling organisms in harbors throughout the main Islands. None are noted to exist only in Kewalo Basin.

The physical and biotic composition of the entrance channel is somewhat different than the basin. Walls of the entrance channel consist of sediment-covered rubble with interspersed patches of sandy mud (Figure 14). Much of the sediment on the hard substrata was bound in a veneer of algal turf. Walls of the channel did not contain the diverse assemblages of fouling organisms that were observed on the structures within the harbor basin. The floor of the inner channel consisted predominantly of a layer of fine-grained sandy mud similar to what was observed within the basin (Figure 15). With distance seaward, bottom cover of mud decreased with increasing cover of rocks on a hard limestone platform (Figure 15). Several isolated scattered colonies of living corals were observed in the channel approximately in line with the end of the jetty (i.e., the makai point of the eastern channel wall) (Figure 16).

The State of Hawaiʻi Department of Land and Natural Resources (DLNR) Division of Aquatic Resources lists a variety of "regulated" marine fishes and invertebrates. Marine invertebrates include primarily species valued as food sources, including abalone, various clams and oysters, crabs, shrimp, lobsters, and sea urchins (for complete list and scientific names of regulated species, see http://hawaii.gov/dlnr/dar/regulated_fish_names.html). None of these species were observed within the confines of Kewalo Basin, or within the inner entrance channel. While it is possible that burrow noted within the sediment floor of the basin may be from shrimp (ʻopae), no individuals were observed.

IV. SUMMARY and CONCLUSIONS

Kewalo Basin is a mixed-use harbor consisting of 143 boat slips occupied by commercial boats (fishing and excursion) and pleasure craft, which is presently managed by Almar Management under a contract to the HCDA. Existing structures up to 50 years in age have deteriorated, and it is proposed to repair or replace much of the existing harbor infrastructure. The full build-out redevelopment concept for Kewalo Basin increases moorage densities within the harbor, provides modernized amenities to boaters, improves operational efficiencies within the basin, and better integrates the berthing and mooring facilities with shore-side utilities and infrastructure.

As part of this planning process, a preliminary baseline assessment of water quality, sediment quality and biotic community composition was conducted in April 2010. The assessment consisted of a qualitative assessment of marine biota in the area that might be affected by re-building the docks, as well as a general assessment of water quality including measurements of all constituents listed in the DOH Water Quality Standards for estuarine waters. Sediment samples were analyzed for a suite of constituents to evaluate the presence of contaminants.

Water samples collected from nineteen stations within the main harbor basin and extending through the entrance channel to the open ocean revealed patterns of both vertical and horizontal stratification of several inorganic nutrients (Si and NO_3^-) consistent with groundwater input in the most shoreward part of the basin. The opposite trend was evident for NH_4^+ with higher concentrations in bottom samples, likely as a result of metabolic processes of benthos inhabiting the sediment column. Overall, values of turbidity were elevated in bottom samples relative to surface samples collected at the same station, while Chlorophyll *a* was elevated in surface samples.

For the samples collected for the present study, the only constituents with concentrations over State of Hawai'i DOHWater Quality Standards were NO_3^- in several surface samples at stations near the inner shoreline, and NH_4^+ in several bottom samples.

Analyses of a variety of chemical constituents in sediment collected from three stations within the inner basin revealed consistently elevated concentrations of petroleum products and total metals (particularly chromium, copper, lead and nickel). No TCLP metals, volatile organic compounds, sulfides or reactive cyananide were detected in any samples. One PCB (PCB-1260) and one organochloride pesticide (4,4-DDT) were detected. Of the 84 acid/base/neutral extractable compounds, only one [bis(2-Ethylhexyl)phthalate] was detected at Stations 2 and 3.

Composition of the bottom of the basin consisted of a ubiquitous layer of fine-grained muddy sand covered with a film of cyanobacteria. Numerous burrows from a variety of benthos penetrate the sediment layer. Biotic colonization of the solid surfaces including piers and pilings consist of a typical fouling community made up primarily of bryozoans, hydroid, algae and sponges. None of the components of these fouling communities contained species that are "regulated" by DLNR. In addition, none can be considered rare or of commercial or recreational value. Descriptions of introduced invertebrates prepared by the Bishop Museum and University of Hawai'i indicate that most common alien invertebrates are common members of fouling communities throughout harbors in the main Hawaiian Islands. No introduced invertebrate species were noted as occurring solely within Kewalo Basin.

The inner walls of the channel connecting Kewalo Basin to the open ocean are covered with an algal turf that binds sediment. Other macro-benthos were rare within the inner channel. Reef corals were not present within the basin, nor in the inner section of the entrance channel. Coral colonization of the channel only commenced seaward of the end of the jetty at the outer end of the basin boundary.

In summary, the results of these investigations indicate that demolition, repair, or replacement of existing structures within Kewalo Basin would not cause significant loss of biotic elements or impairment of water quality. The entire basin consists of man-made structures which consist primarily of pilings and bulkheads. The floor of the basin consists of a layer of fine-grained sediments which have accumulated as a result of configuration of the man-made basin. Biotic composition consists entirely of fouling communities that would likely quickly re-colonize new underwater structures that may be installed as part of the improvement project. Gradients of water chemistry constituents indicate input of groundwater to the basin from land, as well as adequate exchange of the water within the basin to prevent build-up of any chemical constituents. The only factor that appears to require consideration is elevated levels of petroleum products, metals, and several contaminants within the sediment column.

At present, physical/chemical conditions of the marine environment within Kewalo Basin are beyond the threshold limits for settlement and/or subsequent growth of reef building corals. The lack of "regulated species" noted within the basin may also be a result of limiting physical/chemical conditions, as well as competitive exclusion by alien species. Biotic communities are presently limited to fouling communities, composed in part of alien species, which provide no positive ecological benefit to the habitat. Such communities of alien fouling organisms are documented as occurring commonly in harbors throughout the main Hawaiian Islands. Increases in vessel traffic or vessel size associated with the proposed improvements may result in periodic increases in turbidity relative to existing conditions. However, as existing conditions are beyond the threshold for colonization of any but highly tolerant fouling organisms, possible increases in turbidity or other physical/chemical alteration of the water column should not result in any further negative changes beyond the present scenario. Similarly, the sloping sides of the entrance channel are presently completely covered with a layer of sediment that likely prevents settlement of corals. Only beyond the boundaries of the basin do corals appear, probably as a result of resuspension and removal of sediment by wave action. These boundary conditions are not likely to change as a result of vessel size or vessel traffic within the basin under future scenarios.

Construction activities may also result in temporary increases in sediment resuspension, and increased turbidity within the water column. It is anticipated that appropriate Best Management Practices (BMP's), including the use of sediment retention devices will be a requirement during construction. Implementation of such BMP's should prevent dispersal of resuspended sediment throughout the basin and entrance channel. While it is not expected that construction activities will result in substantial or long term effects to existing water quality, it is likely that best management practices will include water monitoring that will assess compliance with water quality standards before, during and after construction. If during the course of monitoring it is determined that construction activities are resulting in exceedance of water quality standards within or outside the basin, appropriate mitigative measures stipulated within the monitoring protocols will be exercised.

V. REFERENCES CITED

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FIGURE 1. Aerial photograph of Kewalo Basin, Honolulu, Hawai‘i showing locations of water chemistry sampling stations (pink circles) and sediment samples (yellow stars).

TABLE 1. Water chemistry measurements in Kewalo Basin, Oahu, Hawaii collected on February 23, 2010. Dissolved nutrients shown in micromolar (**μ**M) units. Abbreviations as follows: S=surface; D=deep; BDL=below detection limit. Also shown are Dept. of Health Water Quality standards (DOH WQS) for embayments under wet conditions, not to exceed more than 10% and 2% of the time criteria. Shaded values indicate exceedance of 10% criteria. For sampling station locations, see Figure 1.

Station (ft)		DEPTH (m)	PO_4^{3-} (μM)	NO_3^- (μM)	NH_4^+ (μM)	Si (μM)	TP (μM)	TN (μM)	TOP (μM)	TON (μM)	SALT (o/oo)	Chl-a (μg/L)	TEMP deg. C	TURB. (ntu)	pH	O_2 (%sat.)
1	S	0.1	0.16	2.48	0.24	15.60	0.47	11.79	0.31	9.07	34.574	0.20	25.340	0.08	8.02	98
1	D	5.0	0.20	0.50	0.84	8.33	0.53	11.51	0.33	10.17	34.938	0.35	24.729	0.11	8.04	84
2	S	0.1	0.11	1.71	0.09	13.27	0.41	10.06	0.30	8.26	34.638	0.21	25.307	0.10	8.04	98
2	D	5.6	0.14	0.19	1.03	7.04	0.47	10.57	0.33	9.35	35.004	0.39	24.647	0.21	8.02	90
3	S	0.1	0.27	3.65	0.70	20.31	0.54	12.80	0.27	8.45	34.294	0.23	25.268	0.14	8.12	98
3	D	5.7	0.27	1.42	0.84	13.35	0.61	12.51	0.34	10.25	34.763	0.64	24.674	0.50	8.01	89
4	S	0.1	0.14	1.50	0.76	10.92	0.46	11.23	0.32	8.97	34.753	0.23	25.251	0.11	8.04	97
4	D	6.3	0.12	0.06	0.60	6.75	0.44	9.17	0.32	8.51	34.960	0.29	24.600	0.08	8.05	84
5	S	0.1	0.13	1.43	0.15	11.25	0.44	9.72	0.31	8.14	34.755	0.25	25.005	0.10	8.04	98
5	D	6.1	0.24	0.16	1.41	8.33	0.65	12.63	0.41	11.06	35.019	0.68	24.666	0.26	8.02	87
6	S	0.2	0.13	1.33	0.79	11.42	0.45	12.22	0.32	10.10	34.754	0.25	25.120	0.06	8.04	97
6	D	6.7	0.10	0.02	1.03	5.84	0.51	11.27	0.41	10.22	35.006	0.36	24.592	0.12	8.03	86
7	S	0.1	0.09	1.12	0.62	10.78	0.41	9.63	0.32	7.89	34.759	0.24	24.949	0.10	8.05	98
7	D	6.2	0.12	0.03	2.03	7.48	0.55	12.32	0.43	10.26	35.017	0.59	24.650	0.38	8.01	83
8	S	0.1	0.11	1.08	0.64	10.28	0.41	9.27	0.30	7.55	34.798	0.28	24.861	0.05	8.05	97
8	D	5.9	0.12	bdl	0.64	6.79	0.48	10.75	0.36	10.11	35.015	0.46	24.634	0.16	8.05	84
9	S	0.1	0.20	4.11	0.64	27.61	0.47	12.46	0.27	7.71	34.026	0.17	25.156	0.07	8.04	98
9	D	6.7	0.10	0.46	0.74	11.87	0.47	10.74	0.37	9.54	34.746	0.26	24.589	0.10	8.05	82
10	S	0.1	0.11	2.49	0.32	17.72	0.41	12.16	0.30	9.35	34.455	0.18	25.094	0.06	8.05	98
10	D	7.2	0.13	0.21	0.63	6.21	0.46	10.22	0.33	9.38	35.004	0.33	24.551	0.08	8.03	87
11	S	0.1	0.13	0.94	bdl	10.22	0.43	9.70	0.30	8.76	34.792	0.23	24.973	0.07	8.05	97
11	M	6.8	0.11	0.04	0.12	6.23	0.54	9.56	0.43	9.40	35.022	0.39	24.528	0.16	8.04	85
12	D	0.1	0.16	2.79	0.63	20.10	0.48	13.30	0.32	9.88	34.325	0.18	25.200	0.08	8.04	97
12	S	7.5	0.11	0.07	0.08	6.13	0.44	8.85	0.33	8.70	35.129	0.28	24.530	0.17	8.05	87
13	M	0.1	0.06	1.28	0.02	11.67	0.40	8.62	0.34	7.32	34.807	0.16	25.044	0.05	8.06	96
13	D	6.3	0.11	0.19	0.25	6.22	0.44	8.60	0.33	8.16	35.071	0.24	24.567	0.25	8.04	79
14	S	0.0	0.07	0.65	0.09	9.80	0.38	7.95	0.31	7.21	34.914	0.19	25.010	0.11	8.06	97
14	D	6.8	0.06	0.08	0.08	5.65	0.36	7.34	0.30	7.18	35.070	0.21	24.650	0.12	8.04	90
15	S	0.0	0.05	0.58	0.15	9.82	0.37	9.03	0.32	8.30	34.943	0.22	24.967	0.12	8.06	99
15	D	6.5	0.06	0.26	0.19	6.07	0.37	8.18	0.31	7.73	35.042	0.22	24.673	0.05	8.03	89
16	S	0.1	0.09	0.05	0.09	4.52	0.40	7.74	0.31	7.60	35.112	0.14	24.517	0.03	8.05	99
16	D	5.4	0.05	0.02	0.12	4.25	0.36	7.64	0.31	7.50	35.116	0.14	24.864	0.03	8.05	96
17	S	0.1	0.11	0.09	0.25	3.50	0.40	8.13	0.29	7.79	35.174	0.12	24.734	0.02	8.05	101
17	M	6.8	0.08	0.19	0.25	4.31	0.42	10.38	0.34	9.94	35.112	0.16	24.684	0.02	8.05	99
18	D	0.0	0.06	0.22	0.23	3.93	0.38	7.31	0.32	6.86	35.138	0.10	24.637	0.12	8.04	102
18	S	7.2	0.05	0.18	0.20	4.08	0.35	8.76	0.30	8.38	35.128	0.15	24.631	0.08	8.04	100
19	M	0.1	0.04	0.06	0.19	2.67	0.37	7.09	0.33	6.84	35.157	0.09	24.693	0.03	8.07	102
19	D	10.1	0.07	bdl	0.16	2.47	0.37	7.36	0.30	7.20	35.145	0.07	24.666	0.06	8.07	101
DOH		nte 2%	-	2.50	1.43		2.42	35.71	-	-	*	8.50	**	5.00	***	****
WET		nte 10%	-	1.43	0.93		1.61	25.00	-	-	*	4.50	**	3.00	***	****

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.
** Temperature shall not vary by more than one degree C. from ambient conditions.
***pH shall not deviate more than 0.5 units from a value of 8.1.

TABLE 2. Water chemistry measurements in Kewalo Basin, Oahu, Hawaii collected on February 23, 2010. Nutrient concentrations are shown in units of micrograms per liter (μg/L). Abbreviations as follows: S=surface; D=deep; BDL=below detection limit. Also shown are Dept. of Health Water Quality standards (DOH WQS) for embayments under wet conditions, not to exceed more than 10% and 2% of the time criteria. Shaded values indicate exceedance of 10% criteria. For transect locations, see Figures 1 and 2.

Station (ft)		DEPTH (m)	PO_4^{3-} (μg/L)	NO_3^- (μg/L)	NH_4^+ (μg/L)	Si (μg/L)	TP (μg/L)	TN (μg/L)	TOP (μg/L)	TON (μg/L)	SALT (o/oo)	Chl-a (μg/L)	TEMP deg. C	TURB. (ntu)	pH	DISS. O_2 (%sat.)
1	S	0.1	4.96	34.72	3.36	439.92	14.57	165.06	9.61	126.98	34.574	0.20	25.34	0.08	8.02	98
1	D	5.0	6.20	7.00	11.76	234.91	16.43	161.14	10.23	142.38	34.938	0.35	24.73	0.11	8.04	84
2	S	0.1	3.41	23.94	1.26	374.21	12.71	140.84	9.30	115.64	34.638	0.21	25.31	0.10	8.04	98
2	D	5.6	4.34	2.66	14.42	198.53	14.57	147.98	10.23	130.90	35.004	0.39	24.65	0.21	8.02	90
3	S	0.1	8.37	51.10	9.80	572.74	16.74	179.20	8.37	118.30	34.294	0.23	25.27	0.14	8.12	98
3	D	5.7	8.37	19.88	11.76	376.47	18.91	175.14	10.54	143.50	34.763	0.64	24.67	0.50	8.01	89
4	S	0.1	4.34	21.00	10.64	307.94	14.26	157.22	9.92	125.58	34.753	0.23	25.25	0.11	8.04	97
4	D	6.3	3.72	0.84	8.40	190.35	13.64	128.38	9.92	119.14	34.960	0.29	24.60	0.08	8.05	84
5	S	0.1	4.03	20.02	2.10	317.25	13.64	136.08	9.61	113.96	34.755	0.25	25.01	0.10	8.04	98
5	D	6.1	7.44	2.24	19.74	234.91	20.15	176.82	12.71	154.84	35.019	0.68	24.67	0.26	8.02	87
6	S	0.2	4.03	18.62	11.06	322.04	13.95	171.08	9.92	141.40	34.754	0.25	25.12	0.06	8.04	97
6	D	6.7	3.10	0.28	14.42	164.69	15.81	157.78	12.71	143.08	35.006	0.36	24.59	0.12	8.03	86
7	S	0.1	2.79	15.68	8.68	304.00	12.71	134.82	9.92	110.46	34.759	0.24	24.95	0.10	8.05	98
7	D	6.2	3.72	0.42	28.42	210.94	17.05	172.48	13.33	143.64	35.017	0.59	24.65	0.38	8.01	83
8	S	0.1	3.41	15.12	8.96	289.90	12.71	129.78	9.30	105.70	34.798	0.28	24.86	0.05	8.05	97
8	D	5.9	3.72	bdl	8.96	191.48	14.88	150.50	11.16	141.54	35.015	0.46	24.63	0.16	8.05	84
9	S	0.1	6.20	57.54	8.96	778.60	14.57	174.44	8.37	107.94	34.026	0.17	25.16	0.07	8.04	98
9	D	6.7	3.10	6.44	10.36	334.73	14.57	150.36	11.47	133.56	34.746	0.26	24.59	0.10	8.05	82
10	S	0.1	3.41	34.86	4.48	499.70	12.71	170.24	9.30	130.90	34.455	0.18	25.09	0.06	8.05	98
10	D	7.2	4.03	2.94	8.82	175.12	14.26	143.08	10.23	131.32	35.004	0.33	24.55	0.08	8.03	87
11	S	0.1	4.03	13.16	bdl	288.20	13.33	135.80	9.30	122.64	34.792	0.23	24.97	0.07	8.05	97
11	M	6.8	3.41	0.56	1.68	175.69	16.74	133.84	13.33	131.60	35.022	0.39	24.53	0.16	8.04	85
12	D	0.1	4.96	39.06	8.82	566.82	14.88	186.20	9.92	138.32	34.325	0.18	25.20	0.08	8.04	97
12	S	7.5	3.41	0.98	1.12	172.87	13.64	123.90	10.23	121.80	35.129	0.28	24.53	0.17	8.05	87
13	M	0.1	1.86	17.92	0.28	329.09	12.40	120.68	10.54	102.48	34.807	0.16	25.04	0.05	8.06	96
13	D	6.3	3.41	2.66	3.50	175.40	13.64	120.40	10.23	114.24	35.071	0.24	24.57	0.25	8.04	79
14	S	0.0	2.17	9.10	1.26	276.36	11.78	111.30	9.61	100.94	34.914	0.19	25.01	0.11	8.06	97
14	D	6.8	1.86	1.12	1.12	159.33	11.16	102.76	9.30	100.52	35.070	0.21	24.65	0.12	8.04	90
15	S	0.0	1.55	8.12	2.10	276.92	11.47	126.42	9.92	116.20	34.943	0.22	24.97	0.12	8.06	99
15	D	6.5	1.86	3.64	2.66	171.17	11.47	114.52	9.61	108.22	35.042	0.22	24.67	0.05	8.03	89
16	S	0.1	2.79	0.70	1.26	127.46	12.40	108.36	9.61	106.40	35.112	0.14	24.52	0.03	8.05	99
16	D	5.4	1.55	0.28	1.68	119.85	11.16	106.96	9.61	105.00	35.116	0.14	24.86	0.03	8.05	96
17	S	0.1	3.41	1.26	3.50	98.70	12.40	113.82	8.99	109.06	35.174	0.12	24.73	0.02	8.05	101
17	M	6.8	2.48	2.66	3.50	121.54	13.02	145.32	10.54	139.16	35.112	0.16	24.68	0.02	8.05	99
18	D	0.0	1.86	3.08	3.22	110.83	11.78	102.34	9.92	96.04	35.138	0.10	24.64	0.12	8.04	102
18	S	7.2	1.55	2.52	2.80	115.06	10.85	122.64	9.30	117.32	35.128	0.15	24.63	0.08	8.04	100
19	M	0.1	1.24	0.84	2.66	75.29	11.47	99.26	10.23	95.76	35.157	0.09	24.69	0.03	8.07	102
19	D	10.1	2.17	bdl	2.24	69.65	11.47	103.04	9.30	100.80	35.145	0.07	24.67	0.06	8.07	101
DOH		nte 2%	-	35.00	20.00	-	75.00	500.00	-	-	*	8.50	**	5.00	***	****
WET		nte 10%	-	20.00	13.00	-	50.00	350.00	-	-	*	4.50	**	3.00	***	****

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.
** Temperature shall not vary by more than one degree C. from ambient conditions.
***pH shall not deviate more than 0.5 units from a value of 8.1.
****Dissolved oxygen not less than 75% saturation.

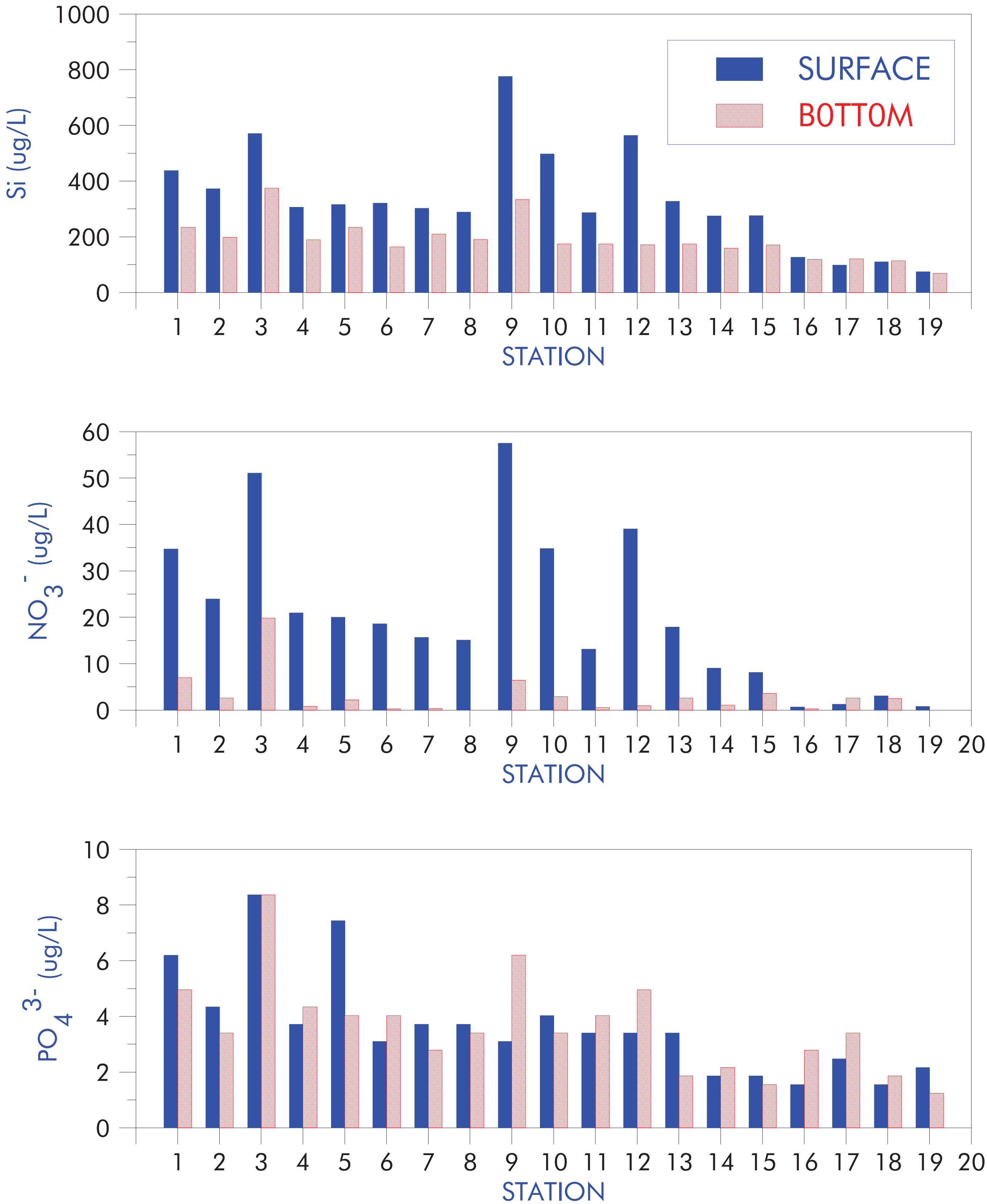

FIGURE 2. Histograms of nutrient concentrations (Si, nitrate, phosphate) at sampling stations within Kewalo Basin, Honolulu, Hawaii. For locations of sampling stations, see Figure 1.

FIGURE 3. Histograms of nutrient concentrations (Total N, Total P, and ammonium nitrogen) at sampling stations within Kewalo Basin, Honolulu, Hawaii. For locations of sampling stations, see Figure 1.

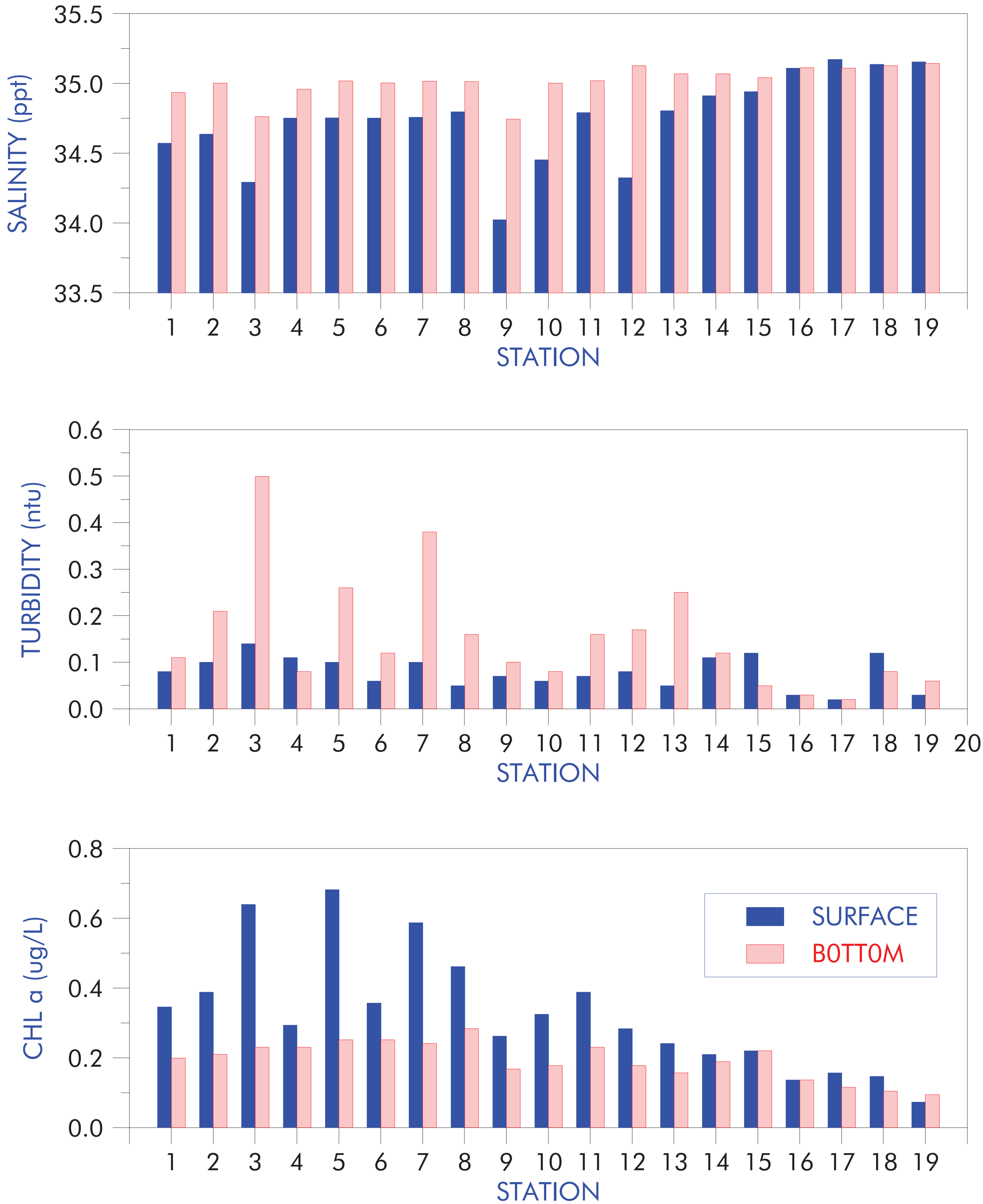

FIGURE 4. Histograms of salinity, turbidity and Chlorophyll a at sampling stations within Kewalo Basin, Honolulu, Hawaii. For locations of sampling stations, see Figure 1.

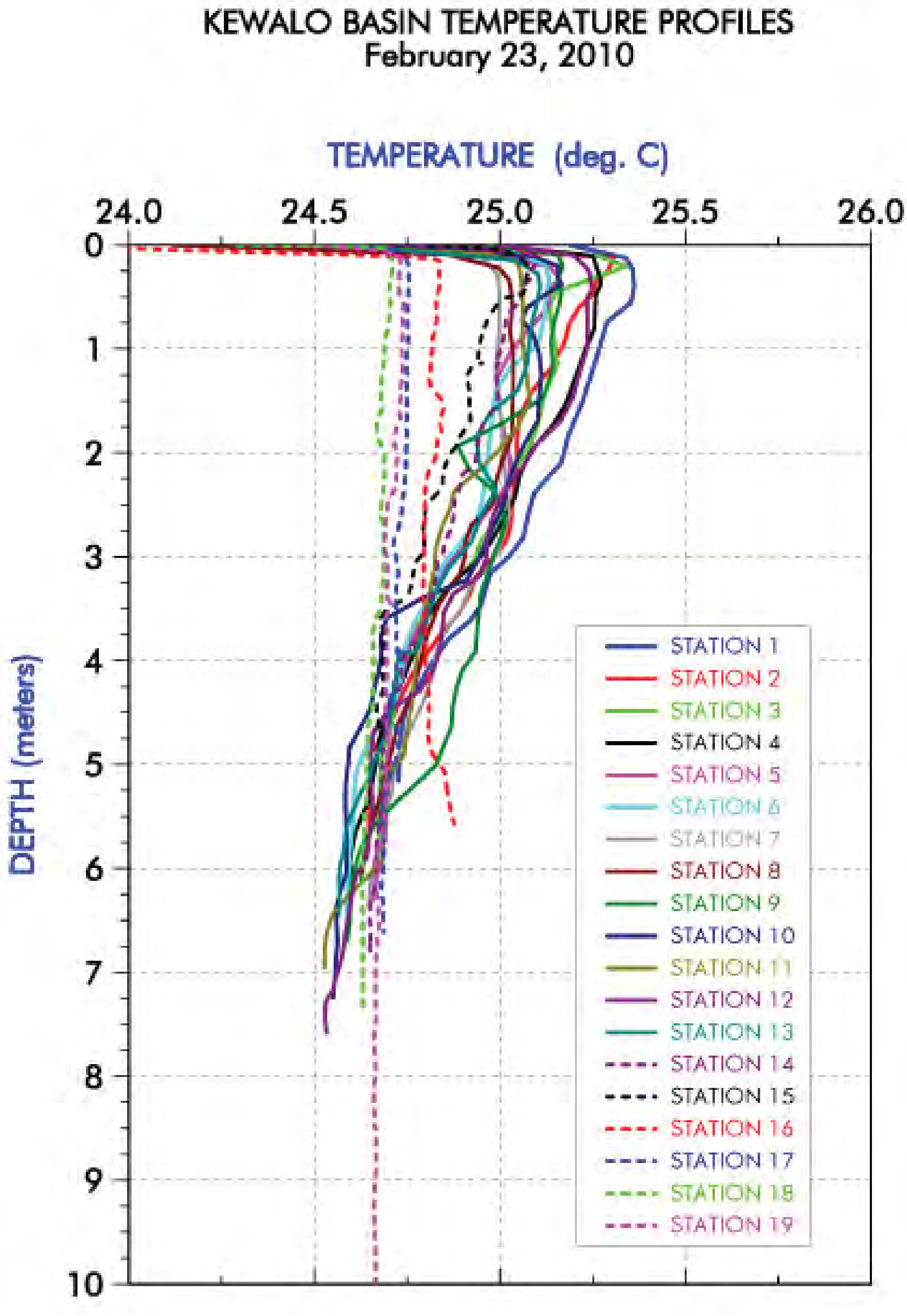

FIGURE 6. Vertical profiles of temperature in Kewalo Basin, Oahu and entrance channel collected on February 23, 2010. For locations of sampling stations, see Figure 1.

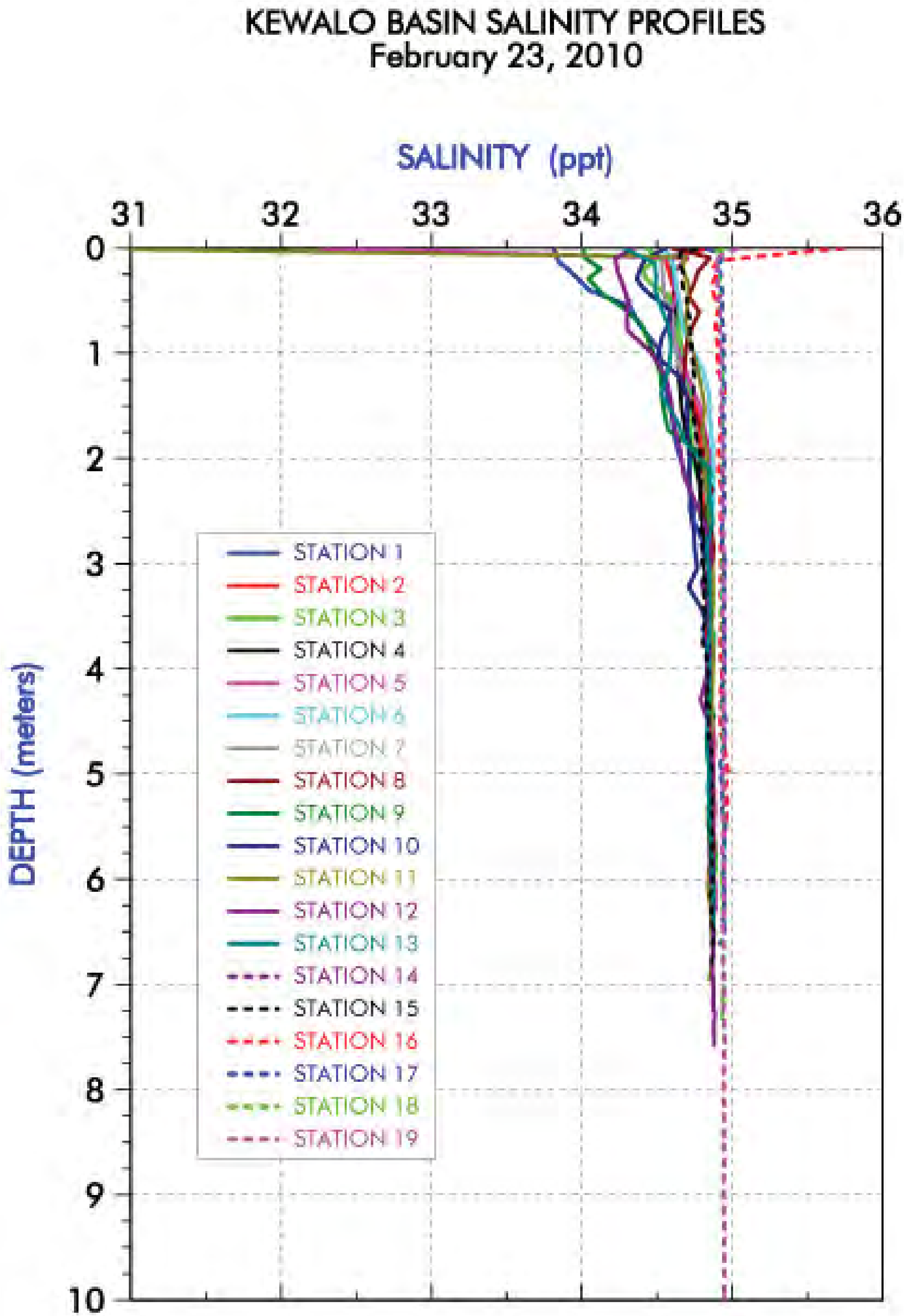

FIGURE 5. Vertical profiles of salinity in Kewalo Basin, Oahu and entrance channel collected on February 23, 2010. For locations of sampling stations, see Figure 1.

TABLE 3. Sediment chemical constituents that were reported as present in three samples collected in Kewalo Basin, Honolulu, Hawaii. For locations of sediment sampling stations, see Figure 1. All constituents listed except TOC are in units of mg/Kg (ppm). "nd" indicates not detected above detection limit. Complete results for all tested constituents are shown in Appendix A.

Constituent	Station 1	Station 2	Station 3
Total Oil/Grease	1140	1430	1050
Total Recoverable Petroleum Hydrocabons	124	228	144
Metals by ICP/MS			
Arsenic	5.56	6.62	8.01
Cadmium	ND	0.3	0.25
Chromium	27.6	37.4	22.3
Copper	102	127	79.8
Lead	88.8	117	85.2
Nickel	17.3	24.5	15.3
Zinc	171	271	167
Mercury	0.85	0.74	0.94
TEPH Fingerprint			
Motor Oil	113	1776	nd
TEPH Diesel	17	377	nd
C06-C10	nd	nd	nd
C10-C22	17	377	nd
C22-C36	113	1776	nd
Organochlorine Pesticides by GC			
4,4-DDT	0.005	0.013	0.005
Chlordane	nd	0.11	nd
Polychorinated Biphenyls (PCBs) by GC PCB-1260	0.05	0.09	0.05
Total Cyanide	0.25	0.23	0.2
Acid/Base/ Neutral Extractables bis(2-Ethylhexyl)phthalate	nd	nd	540
Total Organic Carbon (TOC) % solid	1.7	2.74	1.33

FIGURE 7. Two views of mud bottom covered with film of cyanobacteria in Kewalo Basin, Honolulu, Hawaii. Numerous burrows and mounds from a variety of benthic fauna are found throughout the Basin.

FIGURE 8. Two views of shell bottom along inner edge of Kewalo Basin, Honolulu, Hawaii.

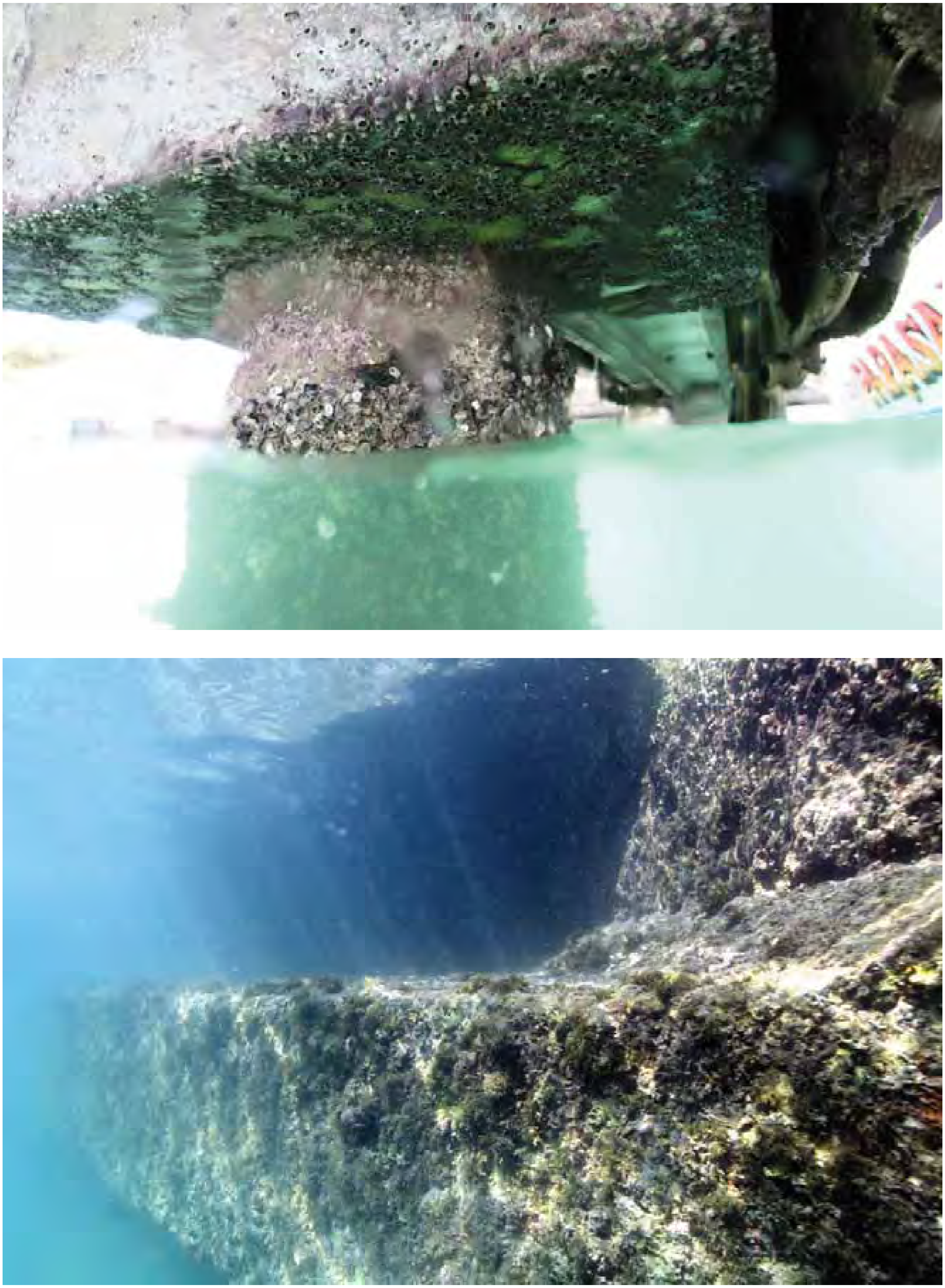

FIGURE 9. Upper photo shows underside of concrete pier piling with encrustation of oysters and barnacles. Bottom photo shows opening of storm drain located in western inshore corner of Kewalo Basin, Honolulu, Hawaii.

FIGURE 10. Two views of fouling communities on pilings in Kewalo Basin, Honolulu, Hawaii. White filamentous growth on piling in left photo is the bryozoan *Zoobotryon verticillatum*. Branching hydroid on top of hanging rope in right photo is *Pennaria disticha, while brown wavy plates* on bottom of hanging rope are the bryozoan *Hippopodina feegeenis*.

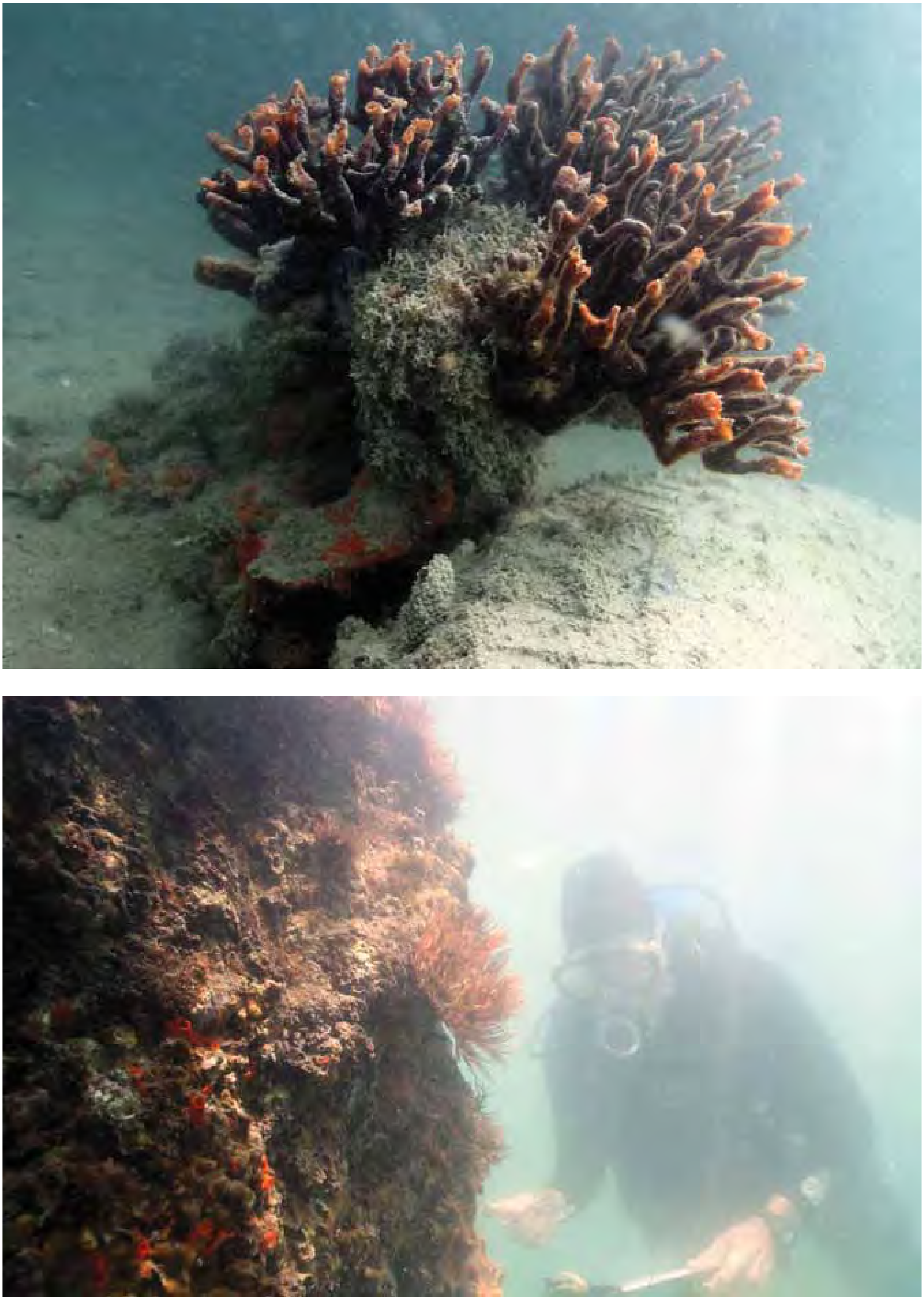

FIGURE 11. Two views of fouling communities on floor and oncrete pilings in Kewalo Basin, Honolulu, Hawaii. Upper photo shows orange bryozoan *Schizoporella unicornis* growing on discarded tire on floor of the Basin. Orange branching form in center of lower photo is the fan worm *Sabellastarte sancti-josephi*. Orange sponge at lower left of lower photo is likely *Suberites zeteki*.

FIGURE 12. Two views of fouling communities on pilings in Kewalo Basin, Honolulu, Hawaii. Green alga on upper portion of piling in top photo is *Bryopsis pennata*; brown alga is unidentified. Green alga in bottom photo is Ulva fasciata. Orange sponges in bottom photo are likely *Mycale armata*.

FIGURE 13. Two views of fouling communities on pilings in Kewalo Basin, Honolulu, Hawaii. Rust-colored cover on pile in top photo is bryozoan *Hippopodina feegeenis*. Tubular projections on pile in bottom photo are likely the sponge *Mycale cecilia*.

FIGURE 14. Two views of eastern edge of entrance channel to Kewalo Basin, Honolulu, Hawaii.

FIGURE 15. Two views of floor of entrance channel of Kewalo Basin, Honolulu, Hawaii.

FIGURE 16. Two isolated coral colonies on the eastern channel wall of Kewalo Basin. Top photo is colony of *Porites lutea*; bottom photo is *Pocillopora* sp. Location of corals in channel is near the end of the jetty on the east side of the basin near station 16 in Figure 1.

FIGURE 17. Aerial photograph of Kewalo Basin showing locations of photographs in Figures 7-16. “T” indicates top photo; “B” indicates bottom photo; “L” indicates left photo, and “R” indicates right photo.

APPENDIX A.

KEWALO BASIN
SEDIMENT CHEMISTRY

ASSOCIATED LABS
ORANGE, CA

FEBRUARY 23, 2010

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900 *FAX 714/538-1209*

CLIENT	Marine Research Consultants	(5188)	LAB REQUEST	250465
	ATTN: Steven Dollar			
	1039 Waakaua Pl.		REPORTED	03/25/2010
	Honolulu, HI 96822-1173		RECEIVED	02/25/2010

PROJECT Kewalo Basin Sediments

SUBMITTER Client

COMMENTS *Matrix Interference

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
1060765	KB-1
1060766	KB-2
1060767	KB-3

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Robert A. Webber
Vice President

NOTE: Unless notified in writing , all samples will be discarded by appropriate disposal protocol 30 days from date reported.

TESTING & CONSULTING
Chemical
Microbiological
Environmental

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
1030 Ignitability of Solids						
Ignitability / Burn Rate	Passes	1		mm/sec	03/16/10	HK
1311/6010B TCLP (ICP Metals)						
Arsenic TCLP	ND	1	0.05	mg/L	03/05/10	KN
Cadmium TCLP	ND	1	0.05	mg/L	03/05/10	KN
Chromium TCLP	ND	1	0.05	mg/L	03/05/10	KN
Lead TCLP	ND	1	0.05	mg/L	03/05/10	KN
Nickel TCLP	ND	1	0.05	mg/L	03/05/10	KN
1311/7470 Mercury TCLP						
Mercury TCLP	ND	1	0.01	mg/L	03/05/10	MDJ
1664 Oil and Grease						
Total Oil and Grease	1140	1	5	mg/Kg	03/19/10	HK
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	124	1	10	mg/Kg	03/02/10	TN
6020 Metals by ICP/MS						
Arsenic	5.56	10	3.0	mg/Kg	03/02/10	NVK
Cadmium	ND	10	5.0	mg/Kg	03/02/10	NVK
Chromium	27.6	10	5.0	mg/Kg	03/02/10	NVK
Copper	102	10	5.0	mg/Kg	03/02/10	NVK
Lead	88.8	10	5.0	mg/Kg	03/02/10	NVK
Nickel	17.3	10	5.0	mg/Kg	03/02/10	NVK
Zinc	171	10	10.0	mg/Kg	03/02/10	NVK
7471A Mercury in Solid/Wipe						
Mercury	0.85	1	0.14	mg/Kg	03/02/10	MDJ

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-1

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015B TEPH Fingerprint						
Motor Oil	113	1	5	mg/Kg	03/02/10	AF
TEPH Diesel	17	1	3	mg/Kg	03/02/10	AF
C06 - C10	ND	1	3	mg/Kg	03/02/10	AF
C10 - C22	17	1	3	mg/Kg	03/02/10	AF
C22 - C36	113	1	5	mg/Kg	03/02/10	AF
Surrogates				**Units**	**Control Limits**	
Triacontane (Sur)	60			%	60 - 140	

8081A - Organochlorine Pesticides by GC

Analyte	Result	DF	DLR	Units	Date/Analyst	
4,4-DDD	ND	1	0.005	mg/Kg	03/03/10	GH
4,4-DDE	ND	1	0.004	mg/Kg	03/03/10	GH
4,4-DDT	0.005	1	0.005	mg/Kg	03/03/10	GH
Aldrin	ND	1	0.004	mg/Kg	03/03/10	GH
Alpha BHC	ND	1	0.002	mg/Kg	03/03/10	GH
Beta BHC	ND	1	0.003	mg/Kg	03/03/10	GH
Chlordane	ND	1	0.025	mg/Kg	03/03/10	GH
Delta BHC	ND	1	0.005	mg/Kg	03/03/10	GH
Dieldrin	ND	1	0.003	mg/Kg	03/03/10	GH
Endosulfan I	ND	1	0.004	mg/Kg	03/03/10	GH
Endosulfan II	ND	1	0.004	mg/Kg	03/03/10	GH
Endosulfan sulfate	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin aldehyde	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin Ketone	ND	1	0.005	mg/Kg	03/03/10	GH
Heptachlor	ND	1	0.004	mg/Kg	03/03/10	GH
Heptachlor epoxide	ND	1	0.003	mg/Kg	03/03/10	GH
Lindane	ND	1	0.003	mg/Kg	03/03/10	GH
Methoxychlor	ND	1	0.025	mg/Kg	03/03/10	GH
Toxaphene	ND	1	0.250	mg/Kg	03/03/10	GH
Surrogates				**Units**	**Control Limits**	
DCB(Sur2)	120			%	55 - 135	
TCMX (Sur1)	114			%	50 - 125	

8082 - Polychlorinated Biphenyls (PCBs) by GC

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8082 - Polychlorinated Biphenyls (PCBs) by GC						
PCB-1016	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1221	ND	1	0.06	mg/Kg	03/03/10	GH
PCB-1232	ND	1	0.05	mg/Kg	03/03/10	GH
PCB-1242	ND	1	0.05	mg/Kg	03/03/10	GH
PCB-1248	ND	1	0.08	mg/Kg	03/03/10	GH
PCB-1254	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1260	0.05	1	0.03	mg/Kg	03/03/10	GH
PCB-1262	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1268	ND	1	0.03	mg/Kg	03/03/10	GH
Surrogates				**Units**	**Control Limits**	
DCB(Sur)	116			%	50 - 135	
8260B Volatile Organic Compounds						
1,1,1,2-Tetrachloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,1-Trichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,2,2-Tetrachloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,2-Trichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,2-Trichlorotrifluoroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1-Dichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1-Dichloroethene	ND	1	5	ug/Kg	03/01/10	LZ
1,1-Dichloropropene	ND	1	5	ug/Kg	03/01/10	LZ
1,2,3-Trichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2,3-Trichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,2,4-Trichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2,4-Trimethylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dibromo-3-chloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dibromoethane	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,3,5-Trimethylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,3-Dichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,3-Dichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,4-Dichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
2,2-Dichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
2-Butanone (MEK)	ND	1	100	ug/Kg	03/01/10	LZ
2-Chloroethyl vinyl ether	ND	1	5	ug/Kg	03/01/10	LZ

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8260B Volatile Organic Compounds						
2-Chlorotoluene	ND	1	5	ug/Kg	03/01/10	LZ
4-Chlorotoluene	ND	1	5	ug/Kg	03/01/10	LZ
4-Methyl -2- Pentanone (MIBK)	ND	1	5	ug/Kg	03/01/10	LZ
Acetone	ND	1	50	ug/Kg	03/01/10	LZ
Allyl chloride	ND	1	5	ug/Kg	03/01/10	LZ
Benzene	ND	1	5	ug/Kg	03/01/10	LZ
Bromobenzene	ND	1	5	ug/Kg	03/01/10	LZ
Bromochloromethane	ND	1	5	ug/Kg	03/01/10	LZ
Bromodichloromethane	ND	1	5	ug/Kg	03/01/10	LZ
Bromoform	ND	1	5	ug/Kg	03/01/10	LZ
Bromomethane	ND	1	5	ug/Kg	03/01/10	LZ
Carbon tetrachloride	ND	1	5	ug/Kg	03/01/10	LZ
Chlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
Chloroethane	ND	1	5	ug/Kg	03/01/10	LZ
Chloroform	ND	1	5	ug/Kg	03/01/10	LZ
Chloromethane	ND	1	5	ug/Kg	03/01/10	LZ
cis-1,2-Dichloroethene	ND	1	5	ug/Kg	03/01/10	LZ
cis-1,3-Dichloropropene	ND	1	5	ug/Kg	03/01/10	LZ
cis-1,4-Dichloro-2-butene	ND	1	5	ug/Kg	03/01/10	LZ
Dibromochloromethane	ND	1	5	ug/Kg	03/01/10	LZ
Dibromomethane	ND	1	5	ug/Kg	03/01/10	LZ
Dichlorodifluoromethane	ND	1	5	ug/Kg	03/01/10	LZ
Ethyl benzene	ND	1	5	ug/Kg	03/01/10	LZ
Hexachlorobutadiene	ND	1	5	ug/Kg	03/01/10	LZ
Isopropylbenzene (Cumene)	ND	1	5	ug/Kg	03/01/10	LZ
m and p-Xylene	ND	1	5	ug/Kg	03/01/10	LZ
Methyl-tert-butylether (MTBE)	ND	1	5	ug/Kg	03/01/10	LZ
Methylene chloride	ND	1	5	ug/Kg	03/01/10	LZ
n-Butylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
n-Propylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
Naphthalene	ND	1	5	ug/Kg	03/01/10	LZ
o-Xylene	ND	1	5	ug/Kg	03/01/10	LZ
p-Isopropyltoluene	ND	1	5	ug/Kg	03/01/10	LZ
sec-Butylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
Styrene	ND	1	5	ug/Kg	03/01/10	LZ
tert-Butylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
Tetrachloroethene	ND	1	5	ug/Kg	03/01/10	LZ
Toluene	ND	1	5	ug/Kg	03/01/10	LZ
trans-1,2-Dichloroethene	ND	1	5	ug/Kg	03/01/10	LZ

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8260B Volatile Organic Compounds						
trans-1,3-Dichloropropene	ND	1	5	ug/Kg	03/01/10	LZ
trans-1,4-Dichloro-2-butene	ND	1	5	ug/Kg	03/01/10	LZ
Trichloroethene	ND	1	5	ug/Kg	03/01/10	LZ
Trichlorofluoromethane	ND	1	5	ug/Kg	03/01/10	LZ
Vinyl chloride	ND	1	5	ug/Kg	03/01/10	LZ
Xylenes, total	ND	1	5	ug/Kg	03/01/10	LZ
Surrogates				**Units**	**Control Limits**	
Surr1 - Dibromofluoromethane	86			%	70 - 135	
Surr2 - 1,2-Dichloroethane-d4	101			%	70 - 135	
Surr3 - Toluene-d8	101			%	70 - 135	
Surr4 - p-Bromofluorobenzene	109			%	70 - 135	
8270C Acid/Base/Neutral Extractables						
1,2,4-Trichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,2-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,3-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,4-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
2,4,5-Trichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4,6-Trichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dimethylphenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dinitrophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dinitrotoluene	ND	1	300	ug/Kg	03/02/10	SD
2,6-Dinitrotoluene	ND	1	300	ug/Kg	03/02/10	SD
2-Chloronaphthalene	ND	1	300	ug/Kg	03/02/10	SD
2-Chlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2-Methylnaphthalene	ND	1	300	ug/Kg	03/02/10	SD
2-Methylphenol	ND	1	300	ug/Kg	03/02/10	SD
2-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
2-Nitrophenol	ND	1	300	ug/Kg	03/02/10	SD
3,3-Dichlorobenzidine	ND	1	300	ug/Kg	03/02/10	SD
3-Methylphenol	ND	1	500	ug/Kg	03/02/10	SD
3-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
4,6-Dinitro-2-methylphenol	ND	1	300	ug/Kg	03/02/10	SD
4-Bromophenyl-phenylether	ND	1	300	ug/Kg	03/02/10	SD
4-Chloro-3-methylphenol	ND	1	300	ug/Kg	03/02/10	SD
4-Chloroaniline	ND	1	300	ug/Kg	03/02/10	SD

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8270C Acid/Base/Neutral Extractables						
4-Chlorophenyl-phenylether	ND	1	300	ug/Kg	03/02/10	SD
4-Methylphenol	ND	1	500	ug/Kg	03/02/10	SD
4-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
4-Nitrophenol	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthene	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthylene	ND	1	300	ug/Kg	03/02/10	SD
Anthracene	ND	1	300	ug/Kg	03/02/10	SD
Benzidine	ND	1	1500	ug/Kg	03/02/10	SD
Benzo(a)anthracene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(a)pyrene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(b)fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(g,h,i)perylene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(k)fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Benzoic Acid	ND	1	300	ug/Kg	03/02/10	SD
Benzyl alcohol	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroethoxy)methane	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroethyl)ether	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroisopropyl) ether	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Ethylhexyl)phthalate	ND	1	300	ug/Kg	03/02/10	SD
Butylbenzylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Chrysene	ND	1	300	ug/Kg	03/02/10	SD
Di-n-butylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Di-n-octylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Dibenz(a,h)anthracene	ND	1	300	ug/Kg	03/02/10	SD
Dibenzofuran	ND	1	300	ug/Kg	03/02/10	SD
Diethylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Dimethylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Fluorene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorobutadiene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorocyclopentadiene	ND	1	300	ug/Kg	03/02/10	SD
Hexachloroethane	ND	1	300	ug/Kg	03/02/10	SD
Indeno(1,2,3-c,d)pyrene	ND	1	300	ug/Kg	03/02/10	SD
Isophorone	ND	1	300	ug/Kg	03/02/10	SD
N-Nitroso-di-n-propylamine	ND	1	300	ug/Kg	03/02/10	SD
N-Nitrosodiphenylamine	ND	1	300	ug/Kg	03/02/10	SD
Naphthalene	ND	1	300	ug/Kg	03/02/10	SD
Nitrobenzene	ND	1	300	ug/Kg	03/02/10	SD

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8270C Acid/Base/Neutral Extractables						
Pentachlorophenol	ND	1	300	ug/Kg	03/02/10	SD
Phenanthrene	ND	1	300	ug/Kg	03/02/10	SD
Phenol	ND	1	300	ug/Kg	03/02/10	SD
Pyrene	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthene	ND	1	333	ug/Kg	03/02/10	SD
Acenaphthylene	ND	1	333	ug/Kg	03/02/10	SD
Anthracene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(a)anthracene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(a)pyrene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(b)fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(ghi)perylene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(k)fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Chrysene	ND	1	333	ug/Kg	03/02/10	SD
Dibenzo(a,h)anthracene	ND	1	333	ug/Kg	03/02/10	SD
Fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Fluorene	ND	1	333	ug/Kg	03/02/10	SD
Indeno(1,2,3-cd)pyrene	ND	1	333	ug/Kg	03/02/10	SD
Naphthalene	ND	1	333	ug/Kg	03/02/10	SD
Phenanthrene	ND	1	333	ug/Kg	03/02/10	SD
Pyrene	ND	1	333	ug/Kg	03/02/10	SD

Surrogates	Result	Units	Control Limits
2,4,6-Tribromophenol (sur)	90	%	17 - 122
2-Fluorobiphenyl (sur)	55	%	30 - 115
2-Fluorophenol (sur)	50	%	25 - 121
Nitrobenzene-d5 (sur)	69	%	23 - 120
Phenol-d5 (sur)	62	%	24 - 113
Terphenyl-d14 (sur)	66	%	18 - 137

9014 Total and Amenable Cyanide

Analyte	Result	DF	DLR	Units	Date	Analyst
Total Cyanide	0.25	1	0.5	mg/Kg	03/06/10	TP

9034 Total Sulfide

Analyte	Result	DF	DLR	Units	Date	Analyst
Soluble Sulfide	ND	1	10.0	mg/Kg	03/22/10	HK
Sulfide	ND	1	10.0	mg/Kg	03/22/10	HK

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060765 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-1
Date Sampled: 02/23/2010
Time Sampled: 12:05
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
9095 Paint Filter Test						
Free Liquid	ND	1	0.1	%	03/17/10	HK
CFA_S18_0 TOC in Solid Samples						
TOC	1.70	1	0.01	%	03/23/10	HK
Reactive Cyanide by SW846-7.3						
Reactive Cyanide	ND	1	25	mg/Kg	03/22/10	HK

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060766
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-2

Analyte	Result	DF	DLR	Units	Date/Analyst	
1030 Ignitability of Solids						
Ignitability / Burn Rate	Passes	1		mm/sec	03/16/10	HK
1311/6010B TCLP (ICP Metals)						
Arsenic TCLP	ND	1	0.05	mg/L	03/05/10	KN
Cadmium TCLP	ND	1	0.05	mg/L	03/05/10	KN
Chromium TCLP	ND	1	0.05	mg/L	03/05/10	KN
Lead TCLP	ND	1	0.05	mg/L	03/05/10	KN
Nickel TCLP	ND	1	0.05	mg/L	03/05/10	KN
1311/7470 Mercury TCLP						
Mercury TCLP	ND	1	0.01	mg/L	03/05/10	MDJ
1664 Oil and Grease						
Total Oil and Grease	1430	1	5	mg/Kg	03/19/10	HK
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	228	1	10	mg/Kg	03/02/10	TN
6020 Metals by ICP/MS						
Arsenic	6.62	10	3.0	mg/Kg	03/02/10	NVK
Cadmium	0.30	10	5.0	mg/Kg	03/02/10	NVK
Chromium	37.4	10	5.0	mg/Kg	03/02/10	NVK
Copper	127	10	5.0	mg/Kg	03/02/10	NVK
Lead	117	10	5.0	mg/Kg	03/02/10	NVK
Nickel	24.5	10	5.0	mg/Kg	03/02/10	NVK
Zinc	271	10	10.0	mg/Kg	03/02/10	NVK
7471A Mercury in Solid/Wipe						
Mercury	0.74	1	0.14	mg/Kg	03/02/10	MDJ

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060766
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-2

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015B TEPH Fingerprint						
Motor Oil	1776	2	10.0	mg/Kg	03/02/10	AF
TEPH Diesel	377	2	5.0	mg/Kg	03/02/10	AF
C06 - C10	ND	2	6.0	mg/Kg	03/02/10	AF
C10 - C22	377	2	6.0	mg/Kg	03/02/10	AF
C22 - C36	1776	2	10.0	mg/Kg	03/02/10	AF
Surrogates				**Units**	**Control Limits**	
Triacontane (Sur)	694*			%	60 - 140	
8081A - Organochlorine Pesticides by GC						
4,4-DDD	ND	1	0.005	mg/Kg	03/03/10	GH
4,4-DDE	ND	1	0.004	mg/Kg	03/03/10	GH
4,4-DDT	0.013	1	0.005	mg/Kg	03/03/10	GH
Aldrin	ND	1	0.004	mg/Kg	03/03/10	GH
Alpha BHC	ND	1	0.002	mg/Kg	03/03/10	GH
Beta BHC	ND	1	0.003	mg/Kg	03/03/10	GH
Chlordane	0.11	1	0.025	mg/Kg	03/03/10	GH
Delta BHC	ND	1	0.005	mg/Kg	03/03/10	GH
Dieldrin	ND	1	0.003	mg/Kg	03/03/10	GH
Endosulfan I	ND	1	0.004	mg/Kg	03/03/10	GH
Endosulfan II	ND	1	0.004	mg/Kg	03/03/10	GH
Endosulfan sulfate	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin aldehyde	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin Ketone	ND	1	0.005	mg/Kg	03/03/10	GH
Heptachlor	ND	1	0.004	mg/Kg	03/03/10	GH
Heptachlor epoxide	ND	1	0.003	mg/Kg	03/03/10	GH
Lindane	ND	1	0.003	mg/Kg	03/03/10	GH
Methoxychlor	ND	1	0.025	mg/Kg	03/03/10	GH
Toxaphene	ND	1	0.250	mg/Kg	03/03/10	GH
Surrogates				**Units**	**Control Limits**	
DCB(Sur2)	106			%	55 - 135	
TCMX (Sur1)	112			%	50 - 125	

8082 - Polychlorinated Biphenyls (PCBs) by GC

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060766 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-2
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8082 - Polychlorinated Biphenyls (PCBs) by GC						
PCB-1016	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1221	ND	1	0.06	mg/Kg	03/03/10	GH
PCB-1232	ND	1	0.05	mg/Kg	03/03/10	GH
PCB-1242	ND	1	0.05	mg/Kg	03/03/10	GH
PCB-1248	ND	1	0.08	mg/Kg	03/03/10	GH
PCB-1254	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1260	0.09	1	0.03	mg/Kg	03/03/10	GH
PCB-1262	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1268	ND	1	0.03	mg/Kg	03/03/10	GH
Surrogates				**Units**	**Control Limits**	
DCB(Sur)	114			%	50 - 135	
8260B Volatile Organic Compounds						
1,1,1,2-Tetrachloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,1-Trichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,2,2-Tetrachloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,2-Trichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1,2-Trichlorotrifluoroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1-Dichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,1-Dichloroethene	ND	1	5	ug/Kg	03/01/10	LZ
1,1-Dichloropropene	ND	1	5	ug/Kg	03/01/10	LZ
1,2,3-Trichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2,3-Trichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,2,4-Trichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2,4-Trimethylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dibromo-3-chloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dibromoethane	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dichloroethane	ND	1	5	ug/Kg	03/01/10	LZ
1,2-Dichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,3,5-Trimethylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,3-Dichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
1,3-Dichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
1,4-Dichlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
2,2-Dichloropropane	ND	1	5	ug/Kg	03/01/10	LZ
2-Butanone (MEK)	ND	1	100	ug/Kg	03/01/10	LZ
2-Chloroethyl vinyl ether	ND	1	5	ug/Kg	03/01/10	LZ

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060766 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-2
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8260B Volatile Organic Compounds						
2-Chlorotoluene	ND	1	5	ug/Kg	03/01/10	LZ
4-Chlorotoluene	ND	1	5	ug/Kg	03/01/10	LZ
4-Methyl -2- Pentanone (MIBK)	ND	1	5	ug/Kg	03/01/10	LZ
Acetone	ND	1	50	ug/Kg	03/01/10	LZ
Allyl chloride	ND	1	5	ug/Kg	03/01/10	LZ
Benzene	ND	1	5	ug/Kg	03/01/10	LZ
Bromobenzene	ND	1	5	ug/Kg	03/01/10	LZ
Bromochloromethane	ND	1	5	ug/Kg	03/01/10	LZ
Bromodichloromethane	ND	1	5	ug/Kg	03/01/10	LZ
Bromoform	ND	1	5	ug/Kg	03/01/10	LZ
Bromomethane	ND	1	5	ug/Kg	03/01/10	LZ
Carbon tetrachloride	ND	1	5	ug/Kg	03/01/10	LZ
Chlorobenzene	ND	1	5	ug/Kg	03/01/10	LZ
Chloroethane	ND	1	5	ug/Kg	03/01/10	LZ
Chloroform	ND	1	5	ug/Kg	03/01/10	LZ
Chloromethane	ND	1	5	ug/Kg	03/01/10	LZ
cis-1,2-Dichloroethene	ND	1	5	ug/Kg	03/01/10	LZ
cis-1,3-Dichloropropene	ND	1	5	ug/Kg	03/01/10	LZ
cis-1,4-Dichloro-2-butene	ND	1	5	ug/Kg	03/01/10	LZ
Dibromochloromethane	ND	1	5	ug/Kg	03/01/10	LZ
Dibromomethane	ND	1	5	ug/Kg	03/01/10	LZ
Dichlorodifluoromethane	ND	1	5	ug/Kg	03/01/10	LZ
Ethyl benzene	ND	1	5	ug/Kg	03/01/10	LZ
Hexachlorobutadiene	ND	1	5	ug/Kg	03/01/10	LZ
Isopropylbenzene (Cumene)	ND	1	5	ug/Kg	03/01/10	LZ
m and p-Xylene	ND	1	5	ug/Kg	03/01/10	LZ
Methyl-tert-butylether (MTBE)	ND	1	5	ug/Kg	03/01/10	LZ
Methylene chloride	ND	1	5	ug/Kg	03/01/10	LZ
n-Butylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
n-Propylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
Naphthalene	ND	1	5	ug/Kg	03/01/10	LZ
o-Xylene	ND	1	5	ug/Kg	03/01/10	LZ
p-Isopropyltoluene	ND	1	5	ug/Kg	03/01/10	LZ
sec-Butylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
Styrene	ND	1	5	ug/Kg	03/01/10	LZ
tert-Butylbenzene	ND	1	5	ug/Kg	03/01/10	LZ
Tetrachloroethene	ND	1	5	ug/Kg	03/01/10	LZ
Toluene	ND	1	5	ug/Kg	03/01/10	LZ
trans-1,2-Dichloroethene	ND	1	5	ug/Kg	03/01/10	LZ

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Order #: 1060766
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-2

Analyte	Result	DF	DLR	Units	Date/Analyst	
8260B Volatile Organic Compounds						
trans-1,3-Dichloropropene	ND	1	5	ug/Kg	03/01/10	LZ
trans-1,4-Dichloro-2-butene	ND	1	5	ug/Kg	03/01/10	LZ
Trichloroethene	ND	1	5	ug/Kg	03/01/10	LZ
Trichlorofluoromethane	ND	1	5	ug/Kg	03/01/10	LZ
Vinyl chloride	ND	1	5	ug/Kg	03/01/10	LZ
Xylenes, total	ND	1	5	ug/Kg	03/01/10	LZ
Surrogates				**Units**	**Control Limits**	
Surr1 - Dibromofluoromethane	82			%	70 - 135	
Surr2 - 1,2-Dichloroethane-d4	97			%	70 - 135	
Surr3 - Toluene-d8	102			%	70 - 135	
Surr4 - p-Bromofluorobenzene	111			%	70 - 135	
8270C Acid/Base/Neutral Extractables						
1,2,4-Trichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,2-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,3-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,4-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
2,4,5-Trichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4,6-Trichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dimethylphenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dinitrophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dinitrotoluene	ND	1	300	ug/Kg	03/02/10	SD
2,6-Dinitrotoluene	ND	1	300	ug/Kg	03/02/10	SD
2-Chloronaphthalene	ND	1	300	ug/Kg	03/02/10	SD
2-Chlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2-Methylnaphthalene	ND	1	300	ug/Kg	03/02/10	SD
2-Methylphenol	ND	1	300	ug/Kg	03/02/10	SD
2-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
2-Nitrophenol	ND	1	300	ug/Kg	03/02/10	SD
3,3-Dichlorobenzidine	ND	1	300	ug/Kg	03/02/10	SD
3-Methylphenol	ND	1	500	ug/Kg	03/02/10	SD
3-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
4,6-Dinitro-2-methylphenol	ND	1	300	ug/Kg	03/02/10	SD
4-Bromophenyl-phenylether	ND	1	300	ug/Kg	03/02/10	SD
4-Chloro-3-methylphenol	ND	1	300	ug/Kg	03/02/10	SD
4-Chloroaniline	ND	1	300	ug/Kg	03/02/10	SD

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Order #: 1060766 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-2
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8270C Acid/Base/Neutral Extractables						
4-Chlorophenyl-phenylether	ND	1	300	ug/Kg	03/02/10	SD
4-Methylphenol	ND	1	500	ug/Kg	03/02/10	SD
4-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
4-Nitrophenol	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthene	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthylene	ND	1	300	ug/Kg	03/02/10	SD
Anthracene	ND	1	300	ug/Kg	03/02/10	SD
Benzidine	ND	1	1500	ug/Kg	03/02/10	SD
Benzo(a)anthracene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(a)pyrene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(b)fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(g,h,i)perylene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(k)fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Benzoic Acid	ND	1	300	ug/Kg	03/02/10	SD
Benzyl alcohol	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroethoxy)methane	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroethyl)ether	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroisopropyl) ether	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Ethylhexyl)phthalate	960	1	300	ug/Kg	03/02/10	SD
Butylbenzylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Chrysene	ND	1	300	ug/Kg	03/02/10	SD
Di-n-butylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Di-n-octylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Dibenz(a,h)anthracene	ND	1	300	ug/Kg	03/02/10	SD
Dibenzofuran	ND	1	300	ug/Kg	03/02/10	SD
Diethylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Dimethylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Fluorene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorobutadiene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorocyclopentadiene	ND	1	300	ug/Kg	03/02/10	SD
Hexachloroethane	ND	1	300	ug/Kg	03/02/10	SD
Indeno(1,2,3-c,d)pyrene	ND	1	300	ug/Kg	03/02/10	SD
Isophorone	ND	1	300	ug/Kg	03/02/10	SD
N-Nitroso-di-n-propylamine	ND	1	300	ug/Kg	03/02/10	SD
N-Nitrosodiphenylamine	ND	1	300	ug/Kg	03/02/10	SD
Naphthalene	ND	1	300	ug/Kg	03/02/10	SD
Nitrobenzene	ND	1	300	ug/Kg	03/02/10	SD

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060766
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-2

Analyte	Result	DF	DLR	Units	Date/Analyst	
8270C Acid/Base/Neutral Extractables						
Pentachlorophenol	ND	1	300	ug/Kg	03/02/10	SD
Phenanthrene	ND	1	300	ug/Kg	03/02/10	SD
Phenol	ND	1	300	ug/Kg	03/02/10	SD
Pyrene	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthene	ND	1	333	ug/Kg	03/02/10	SD
Acenaphthylene	ND	1	333	ug/Kg	03/02/10	SD
Anthracene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(a)anthracene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(a)pyrene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(b)fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(ghi)perylene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(k)fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Chrysene	ND	1	333	ug/Kg	03/02/10	SD
Dibenzo(a,h)anthracene	ND	1	333	ug/Kg	03/02/10	SD
Fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Fluorene	ND	1	333	ug/Kg	03/02/10	SD
Indeno(1,2,3-cd)pyrene	ND	1	333	ug/Kg	03/02/10	SD
Naphthalene	ND	1	333	ug/Kg	03/02/10	SD
Phenanthrene	ND	1	333	ug/Kg	03/02/10	SD
Pyrene	ND	1	333	ug/Kg	03/02/10	SD
Surrogates				**Units**	**Control Limits**	
2,4,6-Tribromophenol (sur)	97			%	17 - 122	
2-Fluorobiphenyl (sur)	65			%	30 - 115	
2-Fluorophenol (sur)	68			%	25 - 121	
Nitrobenzene-d5 (sur)	74			%	23 - 120	
Phenol-d5 (sur)	79			%	24 - 113	
Terphenyl-d14 (sur)	95			%	18 - 137	
9014 Total and Amenable Cyanide						
Total Cyanide	0.23	1	0.5	mg/Kg	03/06/10	TP
9034 Total Sulfide						
Soluble Sulfide	ND	1	10.0	mg/Kg	03/22/10	HK
Sulfide	ND	1	10.0	mg/Kg	03/22/10	HK

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060766
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:16
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-2

Analyte	Result	DF	DLR	Units	Date/Analyst	
9095 Paint Filter Test						
Free Liquid	ND	1	0.1	%	03/17/10	HK
CFA_S18_0 TOC in Solid Samples						
TOC	2.74	1	0.01	%	03/23/10	HK
Reactive Cyanide by SW846-7.3						
Reactive Cyanide	ND	1	25	mg/Kg	03/22/10	HK

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060767
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:24
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-3

Analyte	Result	DF	DLR	Units	Date/Analyst	
1030 Ignitability of Solids						
Ignitability / Burn Rate	Passes	1		mm/sec	03/16/10	HK
1311/6010B TCLP (ICP Metals)						
Arsenic TCLP	ND	1	0.05	mg/L	03/05/10	KN
Cadmium TCLP	ND	1	0.05	mg/L	03/05/10	KN
Chromium TCLP	ND	1	0.05	mg/L	03/05/10	KN
Lead TCLP	ND	1	0.05	mg/L	03/05/10	KN
Nickel TCLP	ND	1	0.05	mg/L	03/05/10	KN
1311/7470 Mercury TCLP						
Mercury TCLP	ND	1	0.01	mg/L	03/05/10	MDJ
1664 Oil and Grease						
Total Oil and Grease	1050	1	5	mg/Kg	03/19/10	HK
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	144	1	10	mg/Kg	03/12/10	TN
6020 Metals by ICP/MS						
Arsenic	8.01	10	3.0	mg/Kg	03/02/10	NVK
Cadmium	0.25	10	5.0	mg/Kg	03/02/10	NVK
Chromium	22.3	10	5.0	mg/Kg	03/02/10	NVK
Copper	79.8	10	5.0	mg/Kg	03/02/10	NVK
Lead	85.2	10	5.0	mg/Kg	03/02/10	NVK
Nickel	15.3	10	5.0	mg/Kg	03/02/10	NVK
Zinc	167	10	10.0	mg/Kg	03/02/10	NVK
7471A Mercury in Solid/Wipe						
Mercury	0.94	1	0.14	mg/Kg	03/02/10	MDJ

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Order #: 1060767
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:24
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-3

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015B TEPH Fingerprint						
Motor Oil	ND	1	5	mg/Kg	03/02/10	AF
TEPH Diesel	ND	1	3	mg/Kg	03/02/10	AF
C06 - C10	ND	1	3	mg/Kg	03/02/10	AF
C10 - C22	ND	1	3	mg/Kg	03/02/10	AF
C22 - C36	ND	1	5	mg/Kg	03/02/10	AF
Surrogates				**Units**	**Control Limits**	
Triacontane (Sur)	ND			%	60 - 140	
8081A - Organochlorine Pesticides by GC						
4,4-DDD	ND	1	0.005	mg/Kg	03/03/10	GH
4,4-DDE	ND	1	0.004	mg/Kg	03/03/10	GH
4,4-DDT	0.005	1	0.005	mg/Kg	03/03/10	GH
Aldrin	ND	1	0.004	mg/Kg	03/03/10	GH
Alpha BHC	ND	1	0.002	mg/Kg	03/03/10	GH
Beta BHC	ND	1	0.003	mg/Kg	03/03/10	GH
Chlordane	ND	1	0.025	mg/Kg	03/03/10	GH
Delta BHC	ND	1	0.005	mg/Kg	03/03/10	GH
Dieldrin	ND	1	0.003	mg/Kg	03/03/10	GH
Endosulfan I	ND	1	0.004	mg/Kg	03/03/10	GH
Endosulfan II	ND	1	0.004	mg/Kg	03/03/10	GH
Endosulfan sulfate	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin aldehyde	ND	1	0.004	mg/Kg	03/03/10	GH
Endrin Ketone	ND	1	0.005	mg/Kg	03/03/10	GH
Heptachlor	ND	1	0.004	mg/Kg	03/03/10	GH
Heptachlor epoxide	ND	1	0.003	mg/Kg	03/03/10	GH
Lindane	ND	1	0.003	mg/Kg	03/03/10	GH
Methoxychlor	ND	1	0.025	mg/Kg	03/03/10	GH
Toxaphene	ND	1	0.250	mg/Kg	03/03/10	GH
Surrogates				**Units**	**Control Limits**	
DCB(Sur2)	87			%	55 - 135	
TCMX (Sur1)	99			%	50 - 125	

8082 - Polychlorinated Biphenyls (PCBs) by GC

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Order #: 1060767

Client: Marine Research Consultants

Matrix: SOLID

Client Sample ID: KB-3

Date Sampled: 02/23/2010

Time Sampled: 12:24

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8082 - Polychlorinated Biphenyls (PCBs) by GC						
PCB-1016	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1221	ND	1	0.06	mg/Kg	03/03/10	GH
PCB-1232	ND	1	0.05	mg/Kg	03/03/10	GH
PCB-1242	ND	1	0.05	mg/Kg	03/03/10	GH
PCB-1248	ND	1	0.08	mg/Kg	03/03/10	GH
PCB-1254	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1260	0.05	1	0.03	mg/Kg	03/03/10	GH
PCB-1262	ND	1	0.03	mg/Kg	03/03/10	GH
PCB-1268	ND	1	0.03	mg/Kg	03/03/10	GH
Surrogates				**Units**	**Control Limits**	
DCB(Sur)	100			%	50 - 135	

8260B Volatile Organic Compounds

Analyte	Result	DF	DLR	Units	Date/Analyst	
1,1,1,2-Tetrachloroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,1,1-Trichloroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,1,2,2-Tetrachloroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,1,2-Trichloroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,1,2-Trichlorotrifluoroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,1-Dichloroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,1-Dichloroethene	ND	1	5	ug/Kg	03/03/10	NZ
1,1-Dichloropropene	ND	1	5	ug/Kg	03/03/10	NZ
1,2,3-Trichlorobenzene	ND	1	5	ug/Kg	03/03/10	NZ
1,2,3-Trichloropropane	ND	1	5	ug/Kg	03/03/10	NZ
1,2,4-Trichlorobenzene	ND	1	5	ug/Kg	03/03/10	NZ
1,2,4-Trimethylbenzene	ND	1	5	ug/Kg	03/03/10	NZ
1,2-Dibromo-3-chloropropane	ND	1	5	ug/Kg	03/03/10	NZ
1,2-Dibromoethane	ND	1	5	ug/Kg	03/03/10	NZ
1,2-Dichlorobenzene	ND	1	5	ug/Kg	03/03/10	NZ
1,2-Dichloroethane	ND	1	5	ug/Kg	03/03/10	NZ
1,2-Dichloropropane	ND	1	5	ug/Kg	03/03/10	NZ
1,3,5-Trimethylbenzene	ND	1	5	ug/Kg	03/03/10	NZ
1,3-Dichlorobenzene	ND	1	5	ug/Kg	03/03/10	NZ
1,3-Dichloropropane	ND	1	5	ug/Kg	03/03/10	NZ
1,4-Dichlorobenzene	ND	1	5	ug/Kg	03/03/10	NZ
2,2-Dichloropropane	ND	1	5	ug/Kg	03/03/10	NZ
2-Butanone (MEK)	ND	1	100	ug/Kg	03/03/10	NZ
2-Chloroethyl vinyl ether	ND	1	5	ug/Kg	03/03/10	NZ

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Order #: 1060767
Matrix: SOLID
Date Sampled: 02/23/2010
Time Sampled: 12:24
Sampled By:

Client: Marine Research Consultants
Client Sample ID: KB-3

Analyte	Result	DF	DLR	Units	Date/Analyst	
8260B Volatile Organic Compounds						
2-Chlorotoluene	ND	1	5	ug/Kg	03/03/10	NZ
4-Chlorotoluene	ND	1	5	ug/Kg	03/03/10	NZ
4-Methyl -2- Pentanone (MIBK)	ND	1	5	ug/Kg	03/03/10	NZ
Acetone	ND	1	50	ug/Kg	03/03/10	NZ
Allyl chloride	ND	1	5	ug/Kg	03/03/10	NZ
Benzene	ND	1	5	ug/Kg	03/03/10	NZ
Bromobenzene	ND	1	5	ug/Kg	03/03/10	NZ
Bromochloromethane	ND	1	5	ug/Kg	03/03/10	NZ
Bromodichloromethane	ND	1	5	ug/Kg	03/03/10	NZ
Bromoform	ND	1	5	ug/Kg	03/03/10	NZ
Bromomethane	ND	1	5	ug/Kg	03/03/10	NZ
Carbon tetrachloride	ND	1	5	ug/Kg	03/03/10	NZ
Chlorobenzene	ND	1	5	ug/Kg	03/03/10	NZ
Chloroethane	ND	1	5	ug/Kg	03/03/10	NZ
Chloroform	ND	1	5	ug/Kg	03/03/10	NZ
Chloromethane	ND	1	5	ug/Kg	03/03/10	NZ
cis-1,2-Dichloroethene	ND	1	5	ug/Kg	03/03/10	NZ
cis-1,3-Dichloropropene	ND	1	5	ug/Kg	03/03/10	NZ
cis-1,4-Dichloro-2-butene	ND	1	5	ug/Kg	03/03/10	NZ
Dibromochloromethane	ND	1	5	ug/Kg	03/03/10	NZ
Dibromomethane	ND	1	5	ug/Kg	03/03/10	NZ
Dichlorodifluoromethane	ND	1	5	ug/Kg	03/03/10	NZ
Ethyl benzene	ND	1	5	ug/Kg	03/03/10	NZ
Hexachlorobutadiene	ND	1	5	ug/Kg	03/03/10	NZ
Isopropylbenzene (Cumene)	ND	1	5	ug/Kg	03/03/10	NZ
m and p-Xylene	ND	1	5	ug/Kg	03/03/10	NZ
Methyl-tert-butylether (MTBE)	ND	1	5	ug/Kg	03/03/10	NZ
Methylene chloride	ND	1	5	ug/Kg	03/03/10	NZ
n-Butylbenzene	ND	1	5	ug/Kg	03/03/10	NZ
n-Propylbenzene	ND	1	5	ug/Kg	03/03/10	NZ
Naphthalene	ND	1	5	ug/Kg	03/03/10	NZ
o-Xylene	ND	1	5	ug/Kg	03/03/10	NZ
p-Isopropyltoluene	ND	1	5	ug/Kg	03/03/10	NZ
sec-Butylbenzene	ND	1	5	ug/Kg	03/03/10	NZ
Styrene	ND	1	5	ug/Kg	03/03/10	NZ
tert-Butylbenzene	ND	1	5	ug/Kg	03/03/10	NZ
Tetrachloroethene	ND	1	5	ug/Kg	03/03/10	NZ
Toluene	ND	1	5	ug/Kg	03/03/10	NZ
trans-1,2-Dichloroethene	ND	1	5	ug/Kg	03/03/10	NZ

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Order #: 1060767 **Client:** Marine Research Consultants
Matrix: SOLID **Client Sample ID:** KB-3
Date Sampled: 02/23/2010
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Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8260B Volatile Organic Compounds						
trans-1,3-Dichloropropene	ND	1	5	ug/Kg	03/03/10	NZ
trans-1,4-Dichloro-2-butene	ND	1	5	ug/Kg	03/03/10	NZ
Trichloroethene	ND	1	5	ug/Kg	03/03/10	NZ
Trichlorofluoromethane	ND	1	5	ug/Kg	03/03/10	NZ
Vinyl chloride	ND	1	5	ug/Kg	03/03/10	NZ
Xylenes, total	ND	1	5	ug/Kg	03/03/10	NZ
Surrogates				**Units**	**Control Limits**	
Surr1 - Dibromofluoromethane	104			%	70 - 135	
Surr2 - 1,2-Dichloroethane-d4	110			%	70 - 135	
Surr3 - Toluene-d8	108			%	70 - 135	
Surr4 - p-Bromofluorobenzene	110			%	70 - 135	
8270C Acid/Base/Neutral Extractables						
1,2,4-Trichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,2-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,3-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
1,4-Dichlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
2,4,5-Trichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4,6-Trichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dichlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dimethylphenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dinitrophenol	ND	1	300	ug/Kg	03/02/10	SD
2,4-Dinitrotoluene	ND	1	300	ug/Kg	03/02/10	SD
2,6-Dinitrotoluene	ND	1	300	ug/Kg	03/02/10	SD
2-Chloronaphthalene	ND	1	300	ug/Kg	03/02/10	SD
2-Chlorophenol	ND	1	300	ug/Kg	03/02/10	SD
2-Methylnaphthalene	ND	1	300	ug/Kg	03/02/10	SD
2-Methylphenol	ND	1	300	ug/Kg	03/02/10	SD
2-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
2-Nitrophenol	ND	1	300	ug/Kg	03/02/10	SD
3,3-Dichlorobenzidine	ND	1	300	ug/Kg	03/02/10	SD
3-Methylphenol	ND	1	500	ug/Kg	03/02/10	SD
3-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
4,6-Dinitro-2-methylphenol	ND	1	300	ug/Kg	03/02/10	SD
4-Bromophenyl-phenylether	ND	1	300	ug/Kg	03/02/10	SD
4-Chloro-3-methylphenol	ND	1	300	ug/Kg	03/02/10	SD
4-Chloroaniline	ND	1	300	ug/Kg	03/02/10	SD

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Date Sampled: 02/23/2010
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Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8270C Acid/Base/Neutral Extractables						
4-Chlorophenyl-phenylether	ND	1	300	ug/Kg	03/02/10	SD
4-Methylphenol	ND	1	500	ug/Kg	03/02/10	SD
4-Nitroaniline	ND	1	300	ug/Kg	03/02/10	SD
4-Nitrophenol	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthene	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthylene	ND	1	300	ug/Kg	03/02/10	SD
Anthracene	ND	1	300	ug/Kg	03/02/10	SD
Benzidine	ND	1	1500	ug/Kg	03/02/10	SD
Benzo(a)anthracene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(a)pyrene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(b)fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(g,h,i)perylene	ND	1	300	ug/Kg	03/02/10	SD
Benzo(k)fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Benzoic Acid	ND	1	300	ug/Kg	03/02/10	SD
Benzyl alcohol	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroethoxy)methane	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroethyl)ether	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Chloroisopropyl) ether	ND	1	300	ug/Kg	03/02/10	SD
bis(2-Ethylhexyl)phthalate	540	1	300	ug/Kg	03/02/10	SD
Butylbenzylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Chrysene	ND	1	300	ug/Kg	03/02/10	SD
Di-n-butylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Di-n-octylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Dibenz(a,h)anthracene	ND	1	300	ug/Kg	03/02/10	SD
Dibenzofuran	ND	1	300	ug/Kg	03/02/10	SD
Diethylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Dimethylphthalate	ND	1	300	ug/Kg	03/02/10	SD
Fluoranthene	ND	1	300	ug/Kg	03/02/10	SD
Fluorene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorobenzene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorobutadiene	ND	1	300	ug/Kg	03/02/10	SD
Hexachlorocyclopentadiene	ND	1	300	ug/Kg	03/02/10	SD
Hexachloroethane	ND	1	300	ug/Kg	03/02/10	SD
Indeno(1,2,3-c,d)pyrene	ND	1	300	ug/Kg	03/02/10	SD
Isophorone	ND	1	300	ug/Kg	03/02/10	SD
N-Nitroso-di-n-propylamine	ND	1	300	ug/Kg	03/02/10	SD
N-Nitrosodiphenylamine	ND	1	300	ug/Kg	03/02/10	SD
Naphthalene	ND	1	300	ug/Kg	03/02/10	SD
Nitrobenzene	ND	1	300	ug/Kg	03/02/10	SD

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Order #: 1060767
Client: Marine Research Consultants
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Client Sample ID: KB-3
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Time Sampled: 12:24
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8270C Acid/Base/Neutral Extractables						
Pentachlorophenol	ND	1	300	ug/Kg	03/02/10	SD
Phenanthrene	ND	1	300	ug/Kg	03/02/10	SD
Phenol	ND	1	300	ug/Kg	03/02/10	SD
Pyrene	ND	1	300	ug/Kg	03/02/10	SD
Acenaphthene	ND	1	333	ug/Kg	03/02/10	SD
Acenaphthylene	ND	1	333	ug/Kg	03/02/10	SD
Anthracene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(a)anthracene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(a)pyrene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(b)fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(ghi)perylene	ND	1	333	ug/Kg	03/02/10	SD
Benzo(k)fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Chrysene	ND	1	333	ug/Kg	03/02/10	SD
Dibenzo(a,h)anthracene	ND	1	333	ug/Kg	03/02/10	SD
Fluoranthene	ND	1	333	ug/Kg	03/02/10	SD
Fluorene	ND	1	333	ug/Kg	03/02/10	SD
Indeno(1,2,3-cd)pyrene	ND	1	333	ug/Kg	03/02/10	SD
Naphthalene	ND	1	333	ug/Kg	03/02/10	SD
Phenanthrene	ND	1	333	ug/Kg	03/02/10	SD
Pyrene	ND	1	333	ug/Kg	03/02/10	SD
Surrogates				**Units**	**Control Limits**	
2,4,6-Tribromophenol (sur)	90			%	17 - 122	
2-Fluorobiphenyl (sur)	59			%	30 - 115	
2-Fluorophenol (sur)	51			%	25 - 121	
Nitrobenzene-d5 (sur)	64			%	23 - 120	
Phenol-d5 (sur)	58			%	24 - 113	
Terphenyl-d14 (sur)	102			%	18 - 137	
9014 Total and Amenable Cyanide						
Total Cyanide	0.2	1	0.5	mg/Kg	03/06/10	TP
9034 Total Sulfide						
Soluble Sulfide	ND	1	10.0	mg/Kg	03/27/10	HK
Sulfide	ND	1	10.0	mg/Kg	03/27/10	HK

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 1060767

Matrix: SOLID

Date Sampled: 02/23/2010

Time Sampled: 12:24

Sampled By:

Client: Marine Research Consultants

Client Sample ID: KB-3

Analyte	Result	DF	DLR	Units	Date/Analyst	
9095 Paint Filter Test						
Free Liquid	ND	1	0.1	%	03/17/10	HK
CFA_S18_0 TOC in Solid Samples						
TOC	1.33	1	0.01	%	03/23/10	HK
Reactive Cyanide by SW846-7.3						
Reactive Cyanide	ND	1	25	mg/Kg	03/22/10	HK

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

250467

CHAIN OF CUSTODY

SUBMITTED BY:

MARINE RESEARCH CONSULTANTS
4467 SIERRA DR. HON., HI 96816

SUBMITTED TO:

ASSOCIATED LABS
806 N. BATAVIA ORANGE, CA 92868

PROJECT: KEWALO BASIN SEDIMENTS

SAMPLE NO.	SAMPLE ID	DATE	TIME	SAMPLE TYPE	# OF CONTAINERS	REQUESTED ANALYSES	PRESERVE
1	KB-1	2/23/10	12:05	GRAB	1	SEE ATTACHED LIST OF ANALYTES	ICE
2	~~KB-1~~ KB-2 JM 2-25-10		12:16	"	"	"	"
3	KB-3	"	12:24	"	"	"	"

SAMPLED BY:		RELINQUISHED BY:		RECEIVED BY:	
Steven Dollar	2/23/10	Steven Dollar	2/23/10	[signature]	ASL
PRINT	DATE	PRINT	DATE	PRINT	DATE
[signature]	12:05	[signature]	16:30	Joan Montoya	2-25-10
SIGNATURE	TIME	SIGNATURE	TIME	SIGNATURE	TIME

PLEASE SIGN AND RETURN WITH SAMPLE RESULTS

Cover photo courtesy of Almar Management

B
Environmental Noise Assessment

D. L. ADAMS ASSOCIATES, LTD.

Consultants in Acoustics and Performing Arts Technologies

Environmental Noise Assessment Report
Kewalo Basin Repairs Project
Honolulu, Oahu, Hawaii

August 2010

DLAA Project No. 10-04

Prepared for:
Helber Hastert & Fee, Planners
Honolulu, Hawaii

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APPENDIX

1.0 EXECUTIVE SUMMARY

1.1 The Kewalo Basin Repairs project in Kakaako involves the repair or replacement of the existing harbor infrastructure. The project will be constructed in phases over time. The various stages of the construction will occur in sequence so as not to disrupt harbor activities.

1.2 The project area currently experiences noise levels typical of an urban environment that vary with the time of day and vehicular traffic patterns of Ala Moana Boulevard. Daytime noise levels measured at the project site ranged from 59 dBA to 69 dBA where the average day-night level, L_{dn}, was 67 dBA.

1.3 Full build out of the Kewalo Basin Repairs project is expected to be completed in a series of phases, where each construction phase is expected to last approximately 8 to 12 months, depending on the type of pier constructed (i.e., fixed or floating). Project construction will involve three general stages which utilize various types of construction equipment. The actual noise levels produced during construction will be a function of the methods employed during each stage of the construction process, the duration of construction activities, and the number of pieces of equipment used. A sound propagation model was developed to predict construction noise at various noise receptor locations in vicinity of the project site.

1.4 Noise levels for all stages of construction are expected to exceed the daytime maximum permissible noise limits at the property line and a permit must be obtained from the State DOH to allow the operation of construction equipment. Intermittent noise from project construction activities will be audible in the vicinity of the project site. The dominant noise sources during construction will be from the vibratory hammer used during the demolition stage and the pile driver used during the installation stage, when ambient noise levels may increase by up to 22 dBA over the existing levels. However, noise from construction activities should be short term and must comply with State Department of Health noise regulations.

1.5 Traffic levels in the future will not be affected once the repairs project is complete. Therefore, a future traffic noise impact due to the project is not expected.

2.0 PROJECT DESCRIPTION

The Kewalo Basin Repairs Project area includes approximately 22 acres in the Kaka'ako Community Planning District on the Island of Oahu, Hawaii. The streets surrounding the site, Ala Moana Boulevard to the north and Ahui Street/Ilalo Street to the west, consist of residential, retail, commercial, and light industrial areas. Ala Moana Regional Park and Kewalo Basin Park border the project site to the east and south.

The proposed project involves the repair or replacement of the existing harbor infrastructure. This involves demolition and removal of all existing submerged structures and replacement of the slips in fixed or floating piers. Due to the availability of funding, the project will be constructed in phases over time. The various stages of the construction will occur in sequence so as not to disrupt harbor activities.

3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

3.1 State of Hawaii, Community Noise Control

The State of Hawaii Community Noise Control Rule [Reference 1] defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to *stationary* noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc. The Community Noise Control Rule does not address most *moving* sources, such as vehicular traffic noise, aircraft noise, or rail transit noise. However, the Community Noise Control Rule does regulate noise related to agricultural, construction, and industrial activities, which may not be stationary.

The maximum permissible noise levels for stationary mechanical equipment are enforced by the State Department of Health (DOH) for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 1. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

The criteria for *impulsive* or impact noise is separate from stationary noise due to the nature of the sound. The DOH defines impulsive noise as " any sound with a rapid rise and decay of sound pressure level, lasting less than one second, caused by sudden contact between two or more surfaces…" Noise from pile driving is considered impulsive noise and the maximum permissible noise level is 10 dB above the specified noise limits for stationary sources, as shown in Figure 1.

3.2 Federal Transit Administration

In general, the DOH Community Noise Rule is not very comprehensive for assessing the impact of a construction project as it only relates to nuisance and hours of allowed activity. Project construction noise criteria should take into account the existing noise environment, the equivalent sound levels, L_{eq}, during the construction activities, the duration of the construction activities, and the adjacent land use. While it is not the intention of the Federal Transit Administration (FTA) to specify standardized criteria for construction noise impact, it has defined guidelines for assessment [Reference 2]. According to the FTA, if the criteria shown in Table 1 are exceeded, there may be adverse community reaction.

Table 1. Federal Transit Administration Construction Noise Impact Threshold

	8- Hour L_{eq} (dBA)	
Land Use	Day (7am – 10pm)	Night (10pm – 7am)
Residential	80	70
Commercial	85	85
Industrial	90	90

3.3 Community Response to Change in Noise Level

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, the average ability of an individual to perceive changes in noise levels is well documented and has been summarized in Table 2 [Reference 3, 4]. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Table 2. Average Ability to Perceive Changes in Noise Level

Sound Level Change (dB)	**Human Perception of Sound**
0	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	Two times (or 1/2) as loud
20	Four times (or 1/4) as loud

A commonly applied criterion for estimating a community’s response to changes in noise level is the ‘community response scale’ proposed by the International Standards Organization (ISO) of the United Nations [Reference 5]. The scale shown in Table 3 relates changes in noise level to the degree of community response and allows for direct estimation of the probable response of a community to a predicted change in noise level.

Table 3. Community Response to Increases in Noise Levels

Sound Level Change (dB)	Category	Response Description
0	None	No observed reaction
5	Little	Sporadic Complaints
10	Medium	Widespread Complaints
15	Strong	Threats of Community Action
20	Very Strong	Vigorous Community Action

4.0 EXISTING ACOUSTICAL ENVIRONMENT

4.1 Noise Measurement Procedure and Locations

Ambient noise level measurements were conducted in two different locations from April 21, 2010 to April 26, 2010 and from May 1, 2010 to May 3, 2010 to assess the existing acoustical environment on or near the project site. The noise measurement locations are shown in Figure 2 and are described below.

L1 - Kewalo Basin: The meter was located inside the fenced gravel lot (formerly utilized by NOAA) that is bordered by Ala Moana Beach Park and the service drive to Kewalo Basin Park. The meter was approximately 750 feet south of the Ala Moana Boulevard. Noise sources included vehicular traffic from Ala Moana Boulevard, occasional vehicles on the service drive, noise from beach goers at the adjacent park, pedestrians, harbor activities, aircraft flyovers, birds, and wind.

L2 - Honolulu Children's Discovery Center: The meter was located on the rooftop of the Children's Discovery Center. The center is approximately 1750 feet west of Kewalo Basin and 1000 feet south of Ala Moana Boulevard. Noise sources included vehicular traffic from the surrounding streets, harbor activities, and aircraft flyovers.

Continuous, hourly averaged equivalent sound levels, L_{eq}, were recorded at each location. The measurements were conducted using a Larson-Davis Laboratories, Model 820, Type 1 Sound Level Meter together with a Gras, Model 40AQ Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone was mounted on a tripod, approximately 6' above grade (or the building structure). A windscreen covered the microphone during the entire measurement period. The sound level meters were secured in a weather resistant case.

4.2 Noise Measurement Results

The measured equivalent sound levels, L_{eq}, in A-weighted decibels (dBA) are graphically presented in Figures 3 and 4 for each location. The ambient sound levels vary with the time of day. The range of equivalent sound levels, L_{eq}, during the day (7:00 a.m. to 10:00 p.m.) and during the night (10:00 p.m. to 7:00 a.m.) and average calculated day-night level, L_{dn}, are summarized for each location below.

Table 4. Summary of Noise Measurement Results

Measurement Location	AM L_{eq}	PM L_{eq}	Average L_{dn}
L1 – Kewalo Basin	59 - 69 dBA	55 -63 dBA	67 dBA
L2 – Children's Center	52 - 66 dBA	48 -57 dBA	61 dBA

5.0 POTENTIAL NOISE IMPACTS

5.1 Proposed Action - Construction Noise

Due to the availability of funding, full build out of the Kewalo Basin Repairs project is expected to be completed in a series of phases, where each construction phase is expected to last approximately 8 to 12 months. Project construction will involve three general stages which utilize various types of construction equipment, as described in Table 5. The construction sequence is expected to alternate between demolition and installation stages so that existing tenants can be accommodated. Therefore, the actual noise levels produced during construction of the proposed Kewalo Basin Repairs Project will be a function of the methods employed during each stage of the construction process.

Table 5. General Construction Stages and Equipment

Construction Stage	Expected Equipment	
A Demolition of Existing Infrastructure:	Dump Trucks Drill Rig Truck Crane	Barges Hydraulic Breaker Vibratory Hammer
B Assembly and Installation of Floats:	Flat Bed Trucks Crane Barges	Auger Drill Pile Driver
C Installation of Utility Lines to Piers:	Pavement Cutter Trencher Compacter	Paver Trucks

Typical ranges of construction equipment noise are shown in Figure 5. The vibratory hammer used during the demolition stage and the pile driver used during the installation stage will be the loudest equipment used during construction. The actual sound levels that will be experienced in the vicinity of the project site are a function of the distance from the noise source, the duration of the construction activities, and the number of pieces of equipment used. The Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) [Reference 6] was used to predict construction noise to 19 noise receptor locations surrounding the project site, as shown in Figure 6. The model was based on a summary of the construction methodology provided by Moffat & Nichol. The model is somewhat conservative, as a flat terrain was assumed with no shielding effects from buildings. Table 6 summarizes the results of the construction noise analysis.

Table 6. Summary of Construction Noise Analysis Results

	Noise Receptor	Land Use	Dist.[N1] (ft)	Existing Ambient Noise[N2] (dBA)	Predicted Construction Noise per Stage[N3] (dBA)			Predicted Ambient Noise during Project Construction Stages[N4] (dBA)		
					A	B	C	A	B	C
1	Kauhale Kakaako	Residential	1800	59-69	63	63	54	65-70	65-70	60-69
2	Kamakee Vista	Residential	1950	59-69	63	63	54	64-70	64-70	60-69
3	Hokua	Residential	2200	59-69	61	62	53	63-70	64-70	60-69
4	1133 Waimanu	Residential	2300	59-69	61	61	52	63-70	63-70	60-69
5	Pacifica	Residential	2400	59-69	61	61	52	63-70	63-70	60-69
6	909 Kapiolani	Residential	2500	59-69	60	61	51	63-70	63-70	60-69
7	Ward Warehouse	Commercial	275	59-69	80	80	71	79-80	79-80	71-73
8	919 Ala Moana	Commercial	1100	59-69	68	68	59	68-71	68-71	62-69
9	Children's Center	Commercial	1750	53-66	63	64	55	64-68	64-68	57-66
10	UH JABSOM	Commercial	2200	53-66	61	62	53	62-67	62-67	56-66
11	Fisherman's Wharf	Commercial	200	60-67	82	82	73	82-83	82-83	73-74
12	Harbor Master	Commercial	200	60-67	82	82	73	82-83	82-83	73-74
13	NOAA	Commercial	350	60-67	77	78	69	77-78	77-78	69-71
14	John Dominis	Commercial	1000	60-67	68	68	59	69-71	69-71	63-68
15	Kewalo Marine Lab	Commercial	1250	60-67	66	67	57	67-70	67-70	62-67
16	Honolulu Marine	Commercial	500	60-67	74	74	65	74-75	74-75	67-69
17	Fishing Conservancy	Commercial	1000	60-67	68	68	59	69-71	69-71	63-68
18	Kewalo Basin Park	Commercial	200	60-67	82	82	73	82-82	82-83	73-74
19	Ala Moana Park	Commercial	500	60-67	74	74	65	74-75	74-75	67-69

Notes:

N1. For noise receptors located greater than 1000 feet from Kewalo Basin, the value is an approximate distance from the noise receptor to the center of the harbor. For receptors within 1000 feet of the harbor, the value is the approximate distance from the noise receptor to the nearest pier.

N2. Existing ambient noise is the range of hourly equivalent sound levels, L_{eq}, measured at the locations described in Section 4 (receptors 9 – 19). Historical noise measurement data representative of urban areas was also used to characterize the ambient noise environment at receptors 1 - 8. The hourly L_{eq} range is based on data collected from 7:00 am to 6:00 pm which corresponds to the allowable construction hours under the Department of Health noise permit.

N3. The predicted construction noise levels are represented as L_{eq} and take into account the usage factor of each piece of equipment, as defined by the RCNM noise prediction model. The construction noise levels were calculated for each construction stage (defined in Table 5). The analysis assumed that all receptors have a line-of-sight to the project site, i.e., shielding was not considered.

N4. The ambient noise levels and predicted construction noise levels were summed logarithmically to estimate noise levels at each receptor location during each stage of construction.

The results of the construction noise analysis show that construction noise levels at all noise receptor locations are expected to be below the Federal Transit Authority's noise impact thresholds of 80 dBA and 85 dBA for residential and commercial land uses, respectively.

Nevertheless, intermittent construction noises will still be audible in the vicinity of the project site, especially during the demolition and installation stages. The increase in ambient noise levels at the upper levels of the nearest residential condominiums (receptors 1-6) that have a line-of-sight to the project site is expected to be 1 to 2 dB, which is an insignificant increase. Construction noise will be most audible for the noise receptors immediately surrounding the project site (receptors 11-19). During the demolition and installation stages, specifically during pile driving activities, ambient noise levels may increase by up to 22 dB over existing levels. This will likely be disturbing to people who participate in activities that take place outdoors (such as at the beach parks). During pile driving or extraction activities, park users will need to raise their voice or reduce the talker-to-listener distance in order to communicate effectively. The severity of the speech interference will depend on how close the park users are to the project site. However, in the break between driving or extraction activities, ambient noise levels are not expected to be significantly higher than existing ambient noise levels. Furthermore, construction noises are expected to be intermittent and short term.

Since both stationary and impulse construction noise levels will exceed maximum permissible noise limits specified in the *Community Noise Rule,* a permit must be obtained from the State DOH to allow the operation of construction equipment.

5.2 In-Kind Replacement Alternative - Construction Noise

The In-Kind Replacement alternative would demolish the existing piers and replace them in their present layout. The noisiest stages of construction for this alternative, i.e., demolition and installation, are the same as described in Section 5.1 and would occur in the same locations. Therefore, it is expected that the construction noise impacts for this alternative would be the same as for the preferred alternative.

5.3 Vehicular Traffic Noise Impacts

A vehicular traffic noise analysis was not completed for this project. Based on the traffic assessment completed for the Kewalo Basin Improvements project [Reference 7], the replacement of the harbor infrastructure is not expected to appreciably increase traffic volumes on the roadways surrounding the project site, specifically, Ala Moana Boulevard, Ward Avenue, and Ahui Street. Therefore, an increase in traffic noise due to the project is not expected after full build-out of the project has been completed.

6.0 NOISE IMPACT MITIGATION

6.1 State DOH Noise Permit

In cases where construction noise exceeds, or is expected to exceed the State's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the State DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels.

In order for the State DOH to issue a construction noise permit, the Contractor must submit a noise permit application to the DOH, which describes the construction activities for the project. Prior to issuing the noise permit, the State DOH may require action by the Contractor to incorporate noise mitigation into the construction plan. The DOH may also require the Contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The Contractor should use reasonable and standard practices to mitigate noise, such as using mufflers on diesel and gasoline engines, using properly tuned and balanced machines, etc. However, the State DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities [Reference 1] are:

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels ... before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."
>
> “No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels... before 9:00 a.m. and after 6:00 p.m. on Saturday."
>
> “No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

The use of pile drivers, hoe rams and jack hammers 25 lbs. or larger, high pressure sprayers, and chain saws are restricted to 9:00 a.m. to 5:30 p.m., Monday through Friday. In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers [Reference 1].

The DOH noise permit does not limit the noise level generated at the construction site, but rather the times at which noisy construction can take place. Therefore, noise mitigation for construction activities should be addressed using project management, such that the time restrictions within the DOH permit are followed.

6.2 State DOH Noise Variance

In cases where nighttime construction is expected, a variance must be obtained from the State DOH to allow the operation of a noise source which emits noise levels in excess of the maximum permissible levels and which operation does not conform to the requirements of the noise permit (i.e., nighttime construction activities which occur between 6:00 p.m. and 7:00 a.m., Monday through Friday).

However, nighttime construction is not anticipated for this project due to the noise sensitive nature of the surrounding community so a variance will not be required.

6.3 Mitigation of Construction Noise

6.3.1 Mitigation of Noise Source

Mitigating construction noise at the source is the most effective form of noise control. The source control methods listed in Table 7 below can be applied to most construction equipment.

Table 7. Construction Noise Source Control Methods

Scheduling	Limit activities that generate the most noise to less sensitive time periods (e.g. daytime hours).
Substitution	Use quieter methods/equipment when possible (e.g. low noise generators, smaller excavators, etc.).
Exhaust Mufflers	Install quality mufflers on equipment.
Reduced Power Options	Use smallest size and/or lowest power as required.
Quieter Backup Alarms	Install manual adjustable or ambient sensitive alarms. Do not use backup alarms during night work.

In general, a majority of the construction noise mitigation is in the form of scheduling, specifically, limiting the construction hours to the time frame specified by the State Department of Health. The pile driver is expected to be the most disruptive piece of equipment used during the construction process so the allowable hours of operation are even more restrictive, as described in Section 6.1.

6.3.2 Mitigation of Noise Path

When source control measures are not sufficient to avoid a noise impact, path control measures must be considered. Non-permanent noise barriers or curtains and equipment enclosures can be installed at the construction site to reduce construction noise in noise sensitive locations.

6.4 Mitigation of Vehicular Traffic Noise

Noise mitigation for vehicular traffic noise is not required as future traffic levels will not be affected by this project.

REFERENCES

1. State of Hawaii, Department of Health, Indoor and Radiological Health Branch. *Chapter 46 of Title 11*, *Community Noise Control*, September, 1996.

2. U.S. Department of Transportation - Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006.

3. M. David Egan, *Architectural Acoustics*, McGraw-Hill Book Company, 1998

4. U.S. Department of Transportation - Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995

5. International Standards Organization ISO/TC 43, *Noise Assessment with Respect to Community Responses*, New York: United Nations, November 1969.

6. *Federal Highway Administration's Roadway Construction Noise Model*, FHWA-HEP-05-054, U.S. Department of Transportation, February 2006.

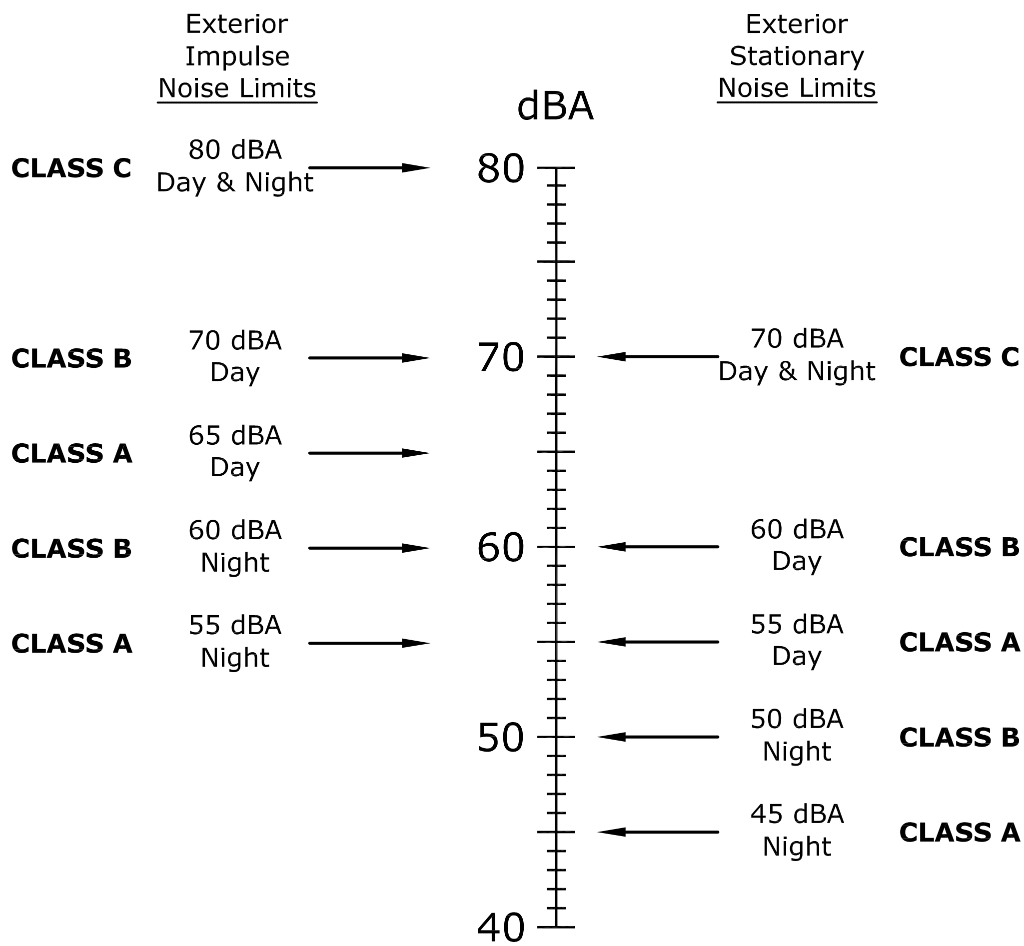
7. *Traffic Assessment of the Kewalo Basin Improvements*, Julian Ng, Inc., August 2010

STATIONARY NOISE:

Zoning District	**Day Hours** (7 AM to 10 PM)	**Night Hours** (10 PM to 7 AM)
CLASS A Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (Exterior)	45 dBA (Exterior)
CLASS B Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (Exterior)	50 dBA (Exterior)
CLASS C Agriculture, Country, Industrial	70 dBA (Exterior)	70 dBA (Exterior)

IMPULSE NOISE:

The maximum permissible noise limit for impulsive noise is 10 dBA above the stationary noise limits.



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Hawaii Maximum Permissible Sound Levels for Various Zoning Districts

Kewalo Basin Repairs

Not to Scale

Date	Project No.	Drawn By
June 2010	10-04	DFD

Figure No
1

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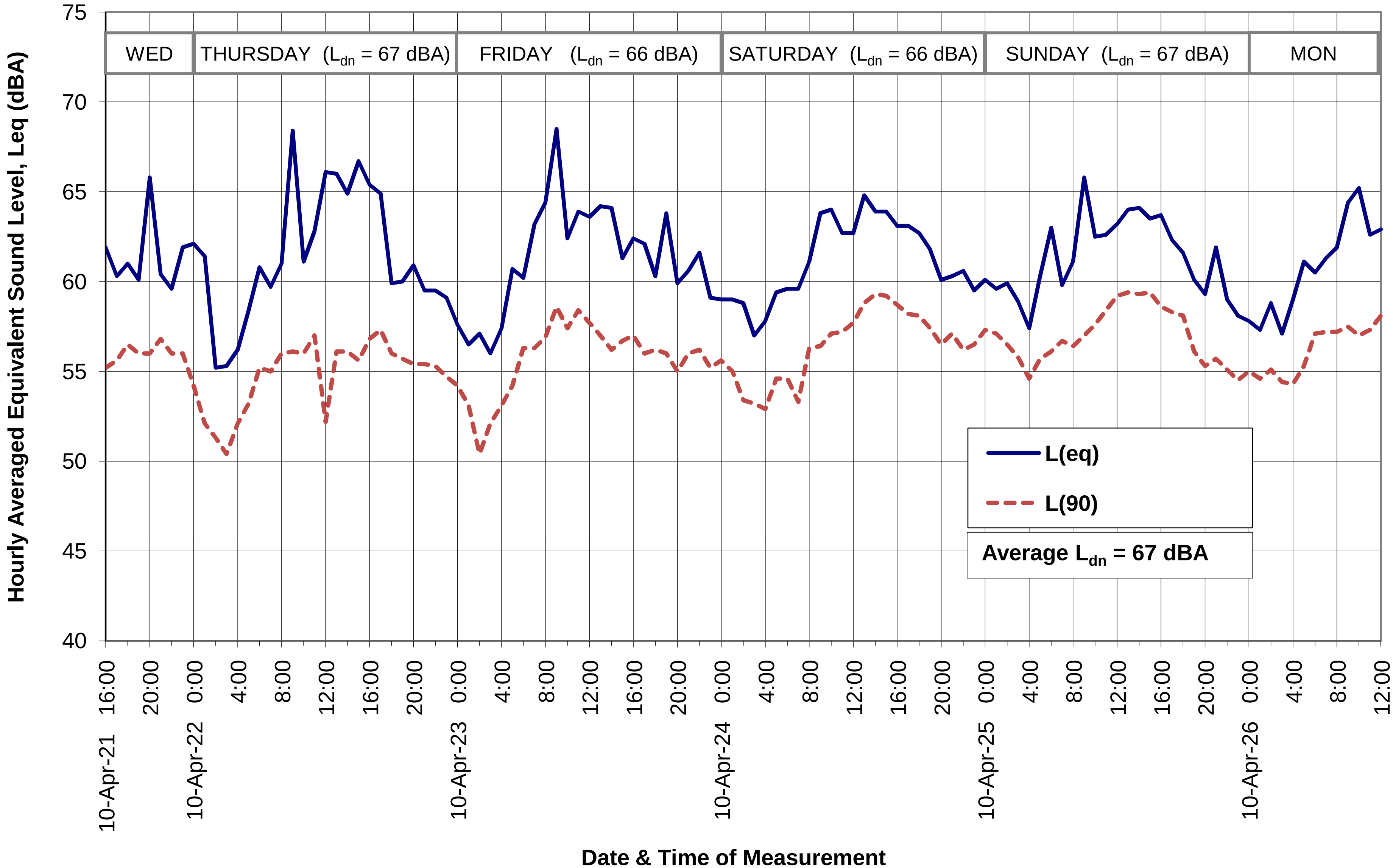
Project Area and Noise Measurement Locations

May 2010	10-04	DFD	Figure No 2
Date	Project No.	Drawn By	



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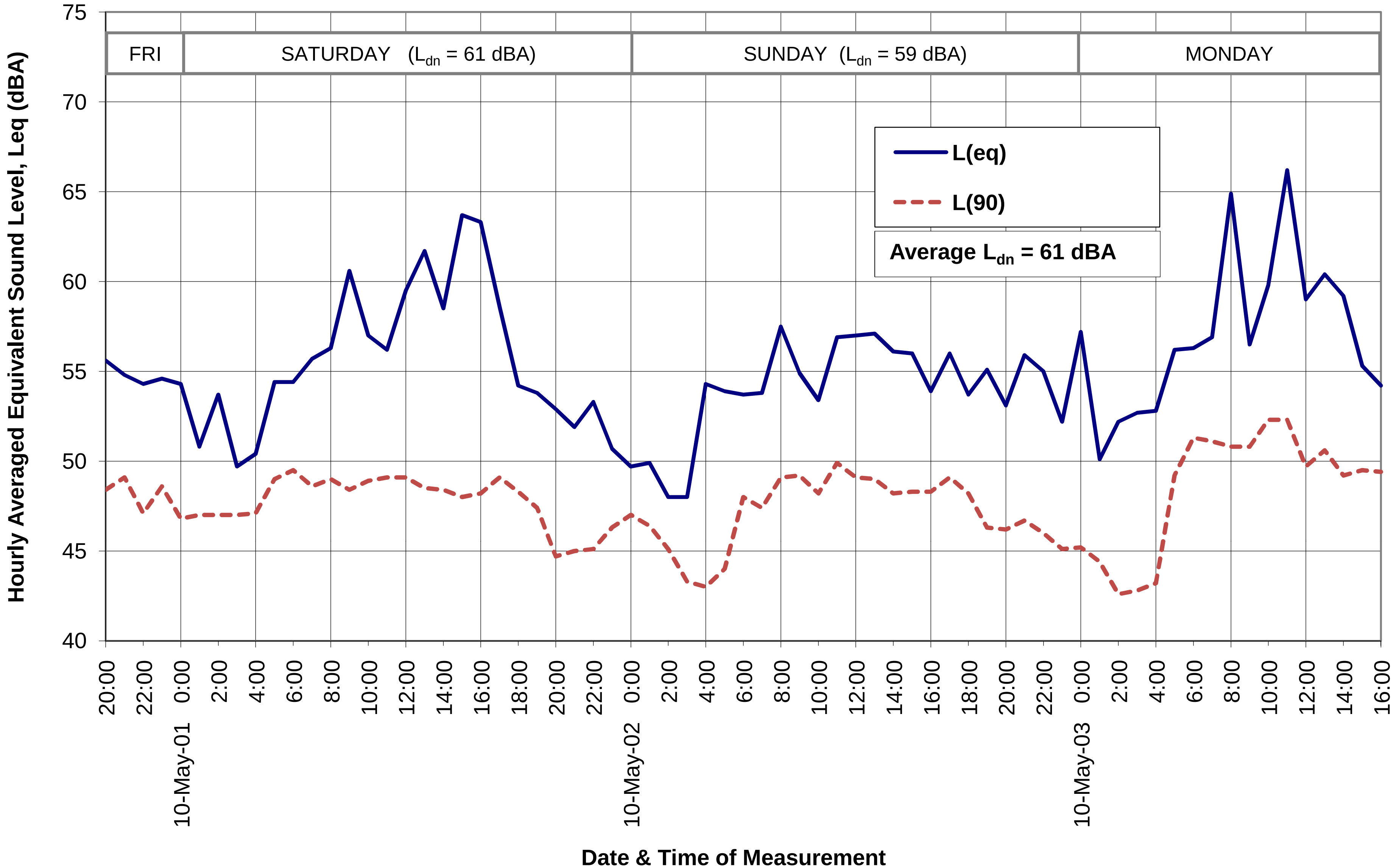
Long Term Noise Measurement Results - Kewalo Basin

Date	Project No.	Drawn By	Figure No
June 2010	10-04	DFD	3



Long Term Noise Measurement Results - Children's Discovery Center

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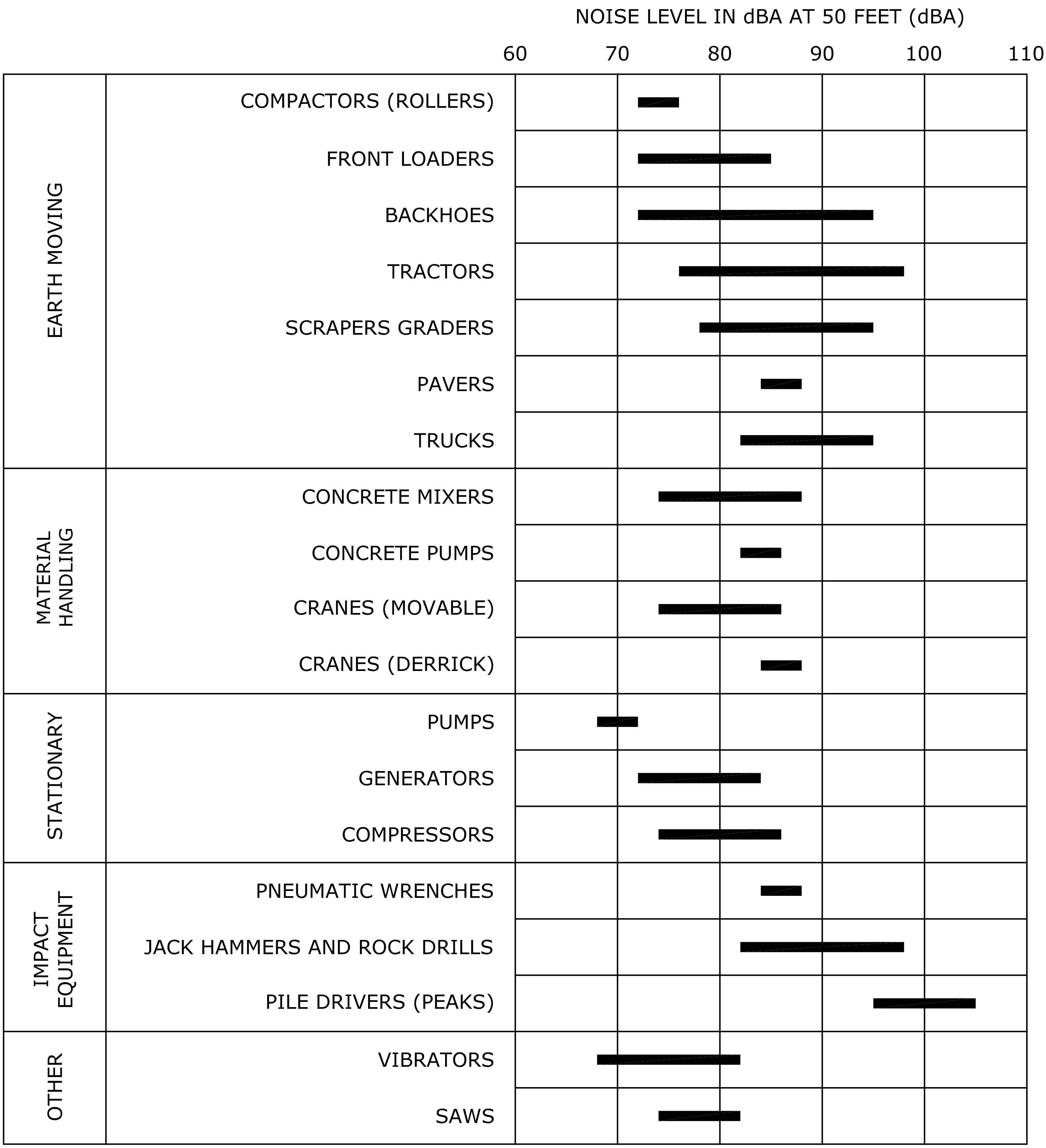
June 2010	10-04	DFD	Figure No 4
Date	Project No.	Drawn By	



NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

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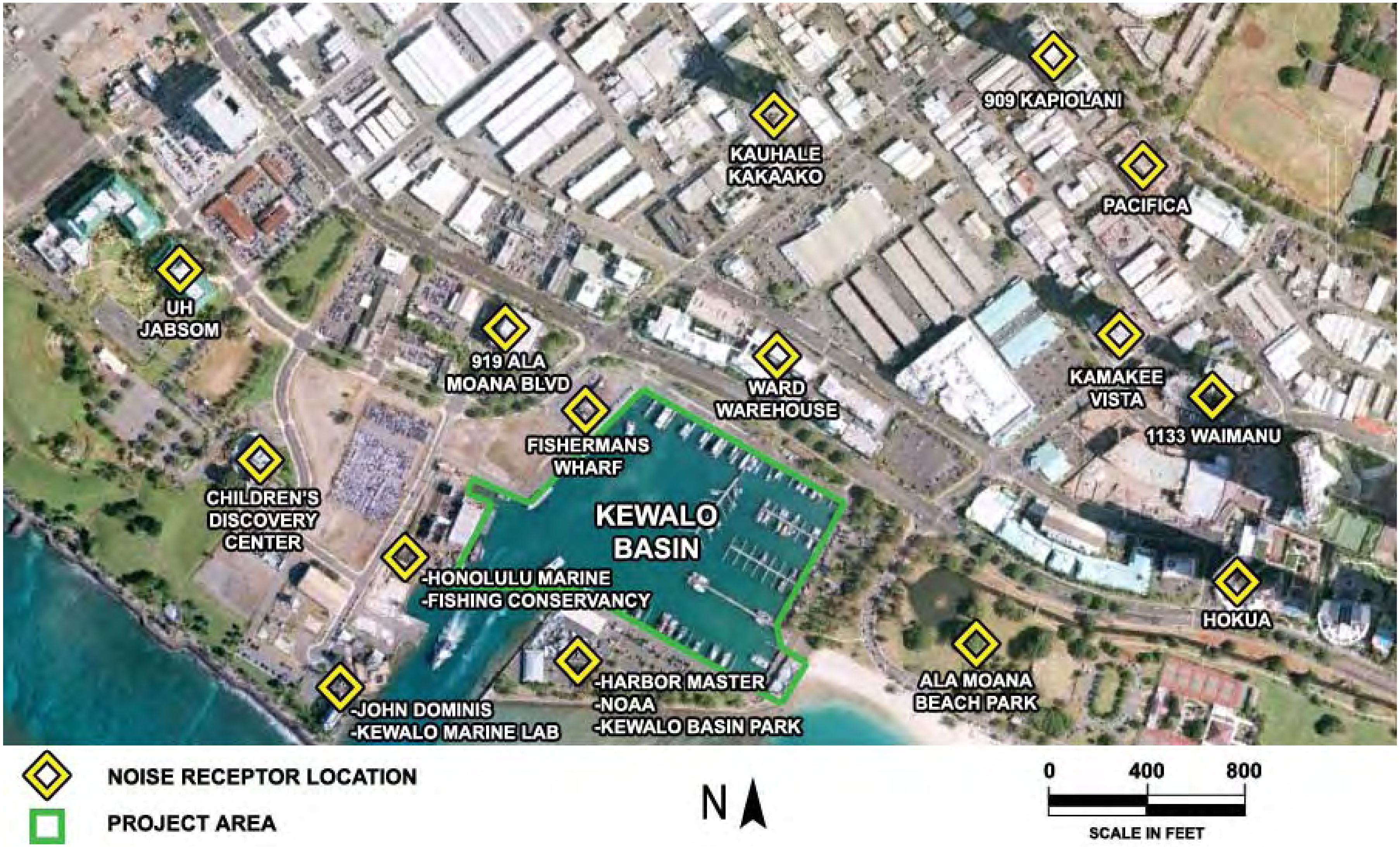
Typical Sound Levels from Construction Equipment

Kewalo Basin Repairs

Not to Scale

Date	Project No.	Drawn By	Figure No
June 2010	10-04	DFD	5



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Project Area and Noise Receptor Locations

Date	Project No.	Drawn By	Figure No
June 2010	10-04	DFD	6

APPENDIX A

Acoustic Terminology

Acoustic Terminology

Sound Pressure Level

Sound, or noise, is the term given to variations in air pressure that are capable of being detected by the human ear. Small fluctuations in atmospheric pressure (sound pressure) constitute the physical property measured with a sound pressure level meter. Because the human ear can detect variations in atmospheric pressure over such a large range of magnitudes, sound pressure is expressed on a logarithmic scale in units called decibels (dB). Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/P_{ref}) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and P_{ref} is the reference pressure, 20 µPa, which is approximately the lowest sound pressure that can be detected by the human ear. For example:

If P = 20 µPa, then SPL = 0 dB
If P = 200 µPa, then SPL = 20 dB
If P = 2000 µPa, then SPL = 40 dB

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound sources, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined sound level of 53 dB, not 100 dB. Two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 6 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

Studies have shown conclusively that at equal sound pressure levels, people are generally more sensitive to certain higher frequency sounds (such as made by speech, horns, and whistles) than most lower frequency sounds (such as made by motors and engines)[1] at the same level. To address this preferential response to frequency, the A-weighted scale was developed. The A-weighted scale adjusts the sound level in each frequency band in much the same manner that the

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1 D.W. Robinson and R.S. Dadson, "A Re-Determination of the Equal-Loudness Relations for Pure Tones," *British Journal of Applied Physics*, vol. 7, pp. 166 - 181, 1956. (Adopted by the International Standards Organization as Recommendation R-226.

human auditory system does. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound and has some correlation with the sensitivity of the human ear to that sound. Different sounds with the same A-weighted sound level are perceived as being equally loud. The A-weighted noise level is commonly used today in environmental noise analysis and in noise regulations. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

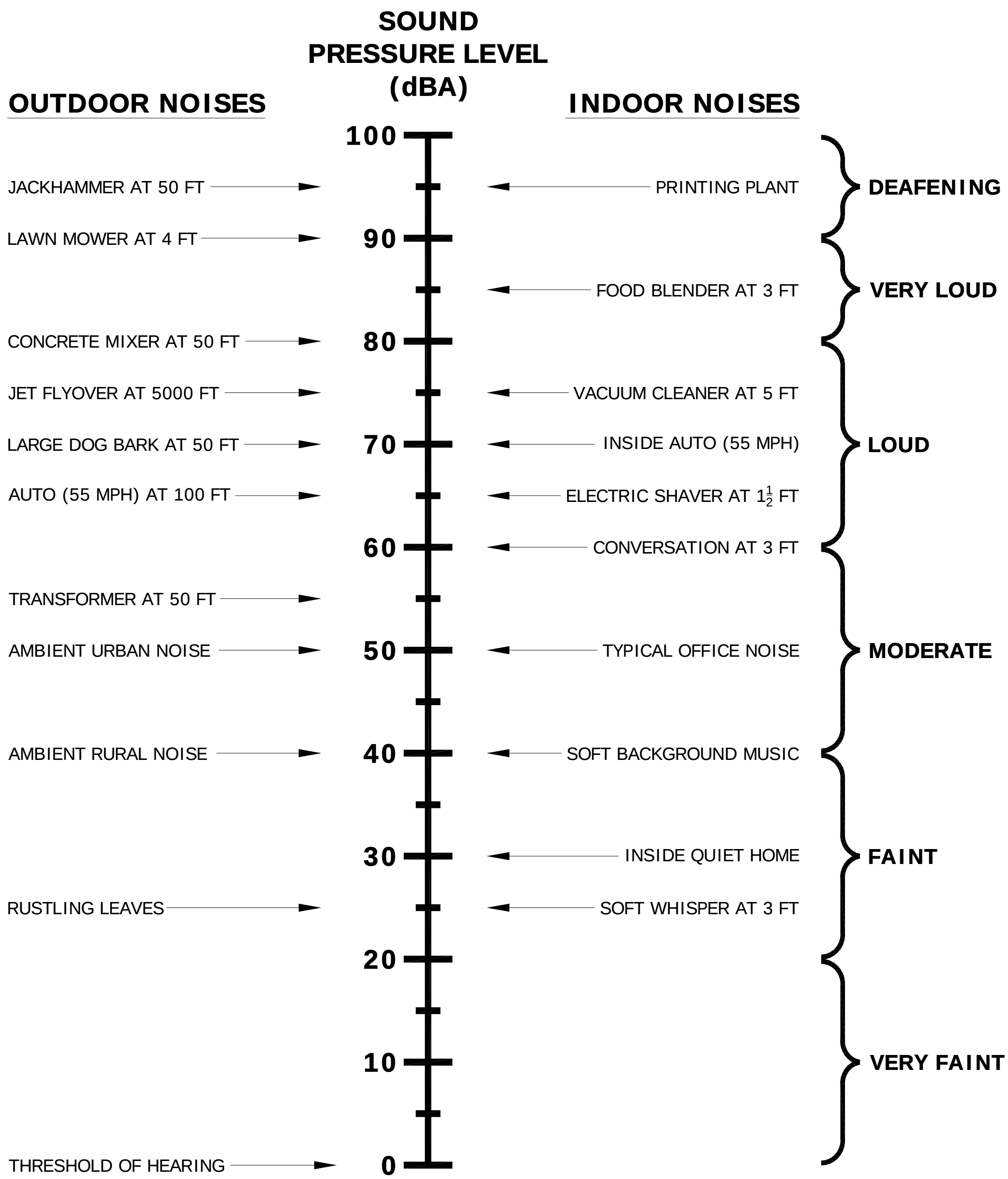

Figure A-1. Common Outdoor/Indoor Sound Levels

Equivalent Sound Level

The Equivalent Sound Level (L_{eq}) is a type of average which represents the steady level that, integrated over a time period, would produce the same energy as the actual signal. The actual *instantaneous* noise levels typically fluctuate above and below the measured L_{eq} during the measurement period. The A-weighted L_{eq} is a common index for measuring environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

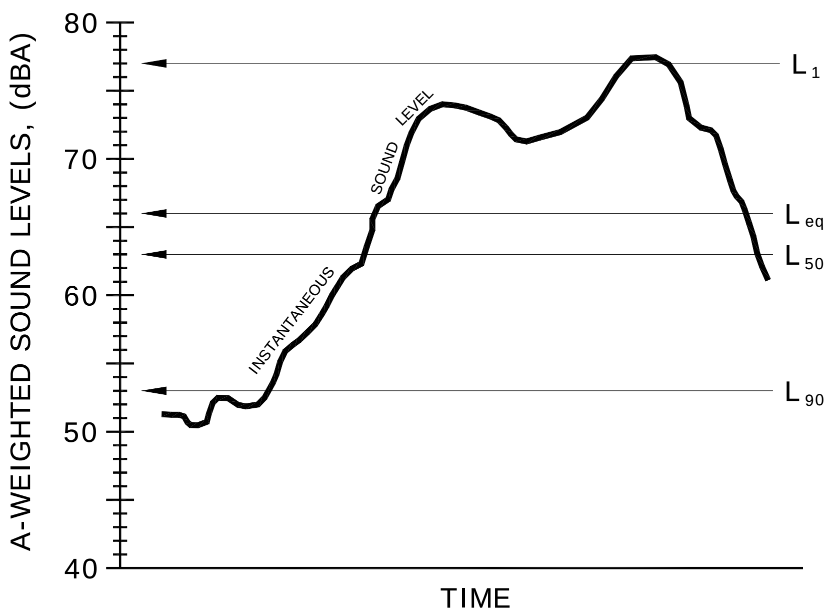

Figure A-2. Example Graph of Equivalent and Statistical Sound Levels

Statistical Sound Level

The sound levels of long-term noise producing activities such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels has been developed. It is known as the Exceedence Level, L_n. The L_n represents the sound level that is exceeded for n% of the measurement time period. For example, L_{10} = 60 dBA indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time. Typically, in noise regulations and standards, the specified time period is one hour. Commonly used Exceedence Levels include L_{01}, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level, L_{dn}, is the Equivalent Sound Level, L_{eq}, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 p.m. and 7 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The L_{dn} is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations.

Cover photo courtesy of Almar Management

C
Underwater Noise Assessment

TECHNICAL MEMORANDUM

SUBJECT: Screening Level Evaluation, Underwater Noise from Pile Driving, Kewalo Basin Repairs Environmental Impact Statement

Prepared By: John Goody

ATTACHMENTS: 1) Calculations Summary Sheet; 20" Concrete Pile
2) Calculations Summary Sheet; 16" Concrete Pile
3) Calculations Summary Sheet; 12 Steel H Pile

1. PURPOSE. This evaluation is undertaken to determine the likely effects of the proposed repairs on the underwater noise environment, with particular concern for the limits of criteria noise levels on protected species and recreational SCUBA divers. The repair project requires drilling and driving piles within the harbor in various potential configurations and locations, and of various piling sizes depending on the design alternative selected.

2. LIMITATIONS. This evaluation is limited to noise generated underwater by pile driving, and is performed at a planning level to screen for the limits of potential impacts. Published data and calculated estimates are used, based on preliminary design information and a simplified conception of the complex, coastal, underwater noise environment. Simplifications and approximations are discussed as they arise in the discussion of methodology.

3. METHODOLOGY. The evaluation methodology makes use of standard noise propagation calculations and published criteria values where applicable, but does not include noise modeling. Because Kewalo Basin is entirely enclosed with the exception of an 80 m wide channel, the noise effects are treated in two components: 1) noise propagated within the harbor, and 2) noise propagated through the harbor entrance channel to the outside coastal waters if exceeding criteria values at the entrance. The following sequence is applied to each of the two preliminary alternatives:

a) Calculate Sound Energy Level (SEL) for each type of pile driving activity using published values for the type of driver and diameter of the pile to be used; three types of piles are considered for use. There are two primary project alternatives, which will use essentially the same types of piles, but in different numbers and different locations reflecting the design alternatives.
b) Estimate the transmission loss for propagation within the harbor using the cylindrical spreading model (applicable for water less than 200 m in depth). This approach ignores sound absorption and scattering, which are not normally significant at distances contained by the harbor dimensions. The NMFS methodology for calculating spreading loss is used herein.

c) Calculate a radius within which sensitivity criteria would be exceeded for species of concern by applying transmission loss to output sources. These radii may be applied to representative locations within the harbor where piles will be driven.

d) Estimate sound energy outside the harbor, if any exceed criterion levels for protected species at the entrance. Only a portion of sound energy generated within would be propagated outside the harbor, the entrance of which is less than 4% of the harbor's enclosed circumference. Noise energy at the harbor entrance would be re-propagated with further transmission losses from that point as limited and shaped by the channel, coastal topography and bathymetry. The noise impacts outside the harbor can be estimated by computing an aggregate, equivalent SEL value at the harbor entrance, and from that point computing further transmission losses beyond. This estimate introduces errors at close distances from combining distributed unit intensities into a single composite intensity for calculation purposes, and by converting a vector (sound energy in a plane wave perpendicular to the direction of propagation) into a scalar value at the point of calculated equivalence assumed to be perpendicular to the harbor entrance. For the purpose of this evaluation, the harbor entrance is taken to be at the seaward end of the south east jetty (refer to Figure 1).

e) Propagation of noise outside the harbor would be affected by absorption and scattering. In particular, the harbor entrance channel is bounded on the west side by a hardened armor rock, rip rap wall for a length of approximately 350 m, and by a shallow reef for approximately 350 m on the east. Shallow water, breaking waves, and back scattering from armor stones would diminish sound energy propagated outside the harbor, the transmission losses of which are too complex to be estimated. The absorption coefficient (a function of frequency and water temperature) could be expected to range from A=0.05 to A=0.12 dB per 1000m, which would be negligible at the distances relevant to this evaluation.

f) Criteria value radii are computed for distances outside the harbor entrance, if applicable.

g) The effects of potential mitigation measures are estimated on the radii of concern.

4. CRITERIA. To determine the potential impacts from sound energy levels generated by pile driving, propagated noise is compared with published criteria values for harassment of protected or listed species. The species of concern are humpback whales and spinner dolphins (order Cetacea), Hawaiian monk seals (sub-order Pinnipedia) and green sea turtles (order/genus Chelonia). The SELs are also considered in comparison to the tolerance of human SCUBA divers to underwater noise.

a) Cetaceans: Harassment level noise is defined by National Marine Fisheries Service (NMFS) as 160 dB root mean square (rms) referenced to 1 micro-Pa. Whales would potentially be present in waters outside the harbor entrance channel in the winter months, primarily between November and April. Dolphins could be present at any time of the year, but would not normally be expected within the harbor.

b) Pinnipeds: Harassment level noise criterion is also 160 dB rms for seals, although in other locales a harassment level of 180dB has been used (Oregon LNG/ CH2Mhill). Hawaiian monk seals are the only pinniped species known to inhabit Oahu coastal waters, and may be present within the harbor, its entrance channel, or outside waters.

c) Chelonia: A definitive criteria on harassment level noise for sea turtles established by observation-based research has not been published. Research suggests that sea turtles have a range of hearing between 80 Hz and 2,000 Hz, with a best hearing range between 100 and 800 Hz, but with a relatively high threshold of response: 100 dB at 100 Hz, to 120 dB at 800 Hz (DOSIT). This frequency range overlaps the frequency of maximum sound energy generated by pile driving (California Department of Transportation, September 2007; LGL limited and JASCO Research Limited; October 2005). NMFS applies an interim protective standard for sea turtles of 160 dB, which is the criterion used herein. Turtles may be present at Kewalo basin within the entrance channel or the harbor.

d) Human Response: Other than occupational settings, there are no specific regulatory limits for underwater noise exposure on humans. However, a good deal of research has been devoted to identification of such potential effects upon occasional exposure in a recreational setting. The Navy has made a comprehensive evaluation in the frequency range of its Low Frequency Wide Band Sonar (NSMRL Technical Report No. 1223 of 13 June 2002), and because the frequency range of pile driving sound energy is in a similar band, the NSMRL findings would generally be applicable to underwater noise generated by pile driving. For bare-headed SCUBA divers, effects were evaluated by subjective rating of loudness and vibration, by relative ability to perform underwater tasks while subjected to sound intensity at various levels, and by sound intensity levels that provoke a “startle” response, which in a diving situation could lead to a dangerous reaction by the diver. The findings of the Navy’s study, in summary, are that Sound Power Levels (analogous to SELs) below 166 dB are tolerated by bare-headed divers, but based on subjective ratings recreational divers should not be exposed to SELs higher than 154 dB.

5. SOURCE NOISE. The source noise of concern is the underwater component of sound energy generated by pile driving. The intensity and frequency of this noise is primarily a function of the type and size (diameter) of the piling, the mechanism of its driving (vibratory, hydraulic hammer, diesel drop hammer), and the hardness and type of substrate through which the pile is being driven. The duration of the period in which the this noise would occur is the same as the duration of pile driving, and depends on the number of piles in that alternative and the time required for driving all the piles. The sound energy pulse from a single strike is a relatively broad spectrum noise depending on specifics outlined above; for the reference piles of this evaluation frequencies of principal noise energies start below 100Hz and extend above 2kHz, with a pulse width of approximately .04 (4 one hundredths) seconds. A representative (average) maximum number of 624 strikes per day has been found by evaluating prior projects and it is estimated that an average of 2 to 3 piles a day can be driven at this rate (WSDOT, 2008). The duration of pile driving underwater noise impacts will depend for each alternative on the number and types of piles to be driven, which has yet to be specifically determined.

Pending completion of geotechnical investigations and refinement of preliminary design alternatives, this evaluation considers two general alternatives making use of 3 representative types of pilings, all driven by diesel drop hammer. The alternatives are: 1) replace existing berthing facilities as presently configured (Replace), and 2) replace and expand facilities to make better use of harbor space (Expand). For this underwater noise evaluation, in which the criteria is root mean square (rms) sound energy level per strike, the important difference between these alternatives is in the locations and types of piles to be driven, which would impact the intensity and location of the noise propagated within the harbor, and because of alignment and proximity to the entrance the amount of that energy which would be expected to propagate outside the harbor. These alternatives are described below. Three reference piles are considered, 20" concrete octagonal with cushion block, 16" concrete octagonal with cushion block, and 12" steel H pile, all driven with diesel drop hammer. Published reference values derived from noise monitoring records (California DOT, 2007) are used for all three piles, in which reference SELs have been adjusted herein as necessary to obtain a uniform reference source at 1 m distance. It is anticipated that 60% of piles driven will be 16" concrete, 30% will be steel H, and 10% will be 20" concrete.

a) Alternative 1) Replace. This alternative is to essentially replace the existing piers in their present configuration. The closest construction activity to the harbor entrance is approximately 300 m from the entrance; the farthest is 520 m away. The approximate center of construction activity is about 420 m from the entrance.

b) Alternative 2) Expand. This alternative requires more piles to be driven and at locations closer to the harbor entrance. Corresponding distances to those in Alternative 1 above are 150 m at the nearest, 520 m farthest, and 330 m approximate average from the harbor entrance.

6. POTENTIAL MITIGATION MEASURES. There are several types of mitigation that may be applicable. For calculation purposes, mitigation measures applied at the source (pile driver) incorporate 10 dB and 20 dB reductions, both of which levels have proven achievable in practical application (California DOT, Oregon LNG). Measures for mitigation of the source SEL may include pre-drilling, use of vibratory drivers, pile cushioning (which is incorporated into the reference SEL herein for both concrete piles), and bubble curtains. In addition, work management mitigation may also be considered, including seasonal limitations and performing work only during daylight hours (allowing visual survey of the affected area for species of concern).

7. FINDINGS. Findings are presented in three parts below, unmitigated for each alternative considering propagation both inside and outside the harbor, and then considering the effects of source mitigation. The extent and location of the affected area depends on the location of the pile being driven as well as the intensity level of the sound produced. Outside the harbor, the entrance to Kewalo Basin being a small proportion of its circumference, propagation of sound energy would be attenuated first by the narrow entrance cross section, then further within the long narrow channel and shallow bordering reef with turbulent, aerated water. Without considering the absorption and scattering impacts of these bathymetric characteristics, if criteria SELs are exceeded at the harbor entrance, then criteria distances seaward from the harbor mouth would be estimated using the closest (worst case) potential pile driving locations; refer to Figures 1 and 2.

Table 1 below summarizes the radius from each type of pile to the point at which the SEL would equal the critical value for both protected species and SCUBA divers; within this radius the SEL would exceed the criterion value

a. Replace (Figure 1):
    i. Inside the Harbor. For use of the 20” concrete pile, the area equaling or exceeding the protected species criteria has a radius of 54 m of the pile being driven. This area would be contained entirely within the harbor for all pilings. The radius for the 16” and 12” piles is 34 m and 9 m respectively. The radius within which recreational SCUBA diving advisory levels are exceeded is 136 m for the largest piling, which is also contained within the harbor.
    ii. Outside the Harbor. Criteria values would not be exceeded outside the harbor. For all types of piling, the SEL is reduced by transmission losses to less than the criteria values at a distance less than that to the harbor entrance from all locations.
b. Expand (Figure 2).
    i. Inside the Harbor. The criteria SEL’s are the same in both alternatives. The radii of concern within the harbor are the same for both.
    ii. Outside the Harbor. The Expand alternative has pile-driving locations closer to the harbor entrance than the Replace alternative, but not so close that the criteria radii extend beyond the

harbor entrance into ocean waters. Criteria values would not be exceeded outside the harbor.

iii. Duration of Construction. This alternative, by rough estimate, would require that approximately 100 more piles be driven than in the Replace alternative, and hence would be expected to require approximately 40 or more working days longer during which pile driving noise would be experienced.

c. Mitigation. Mitigation can take two general forms; 1) reducing the noise emitted by modifying pile driving methods, and 2) monitoring the potentially affected area for receptors of concern and managing working methods to avoid impacts to protected species (or divers) while these are present.

i. Modification of pile driving methods would have an aim of reducing the source SEL below 160 dB. Source SELs for the reference piles are 186 dB, 163 dB, and 174 dB respectively. Mitigation of 10 dB and 20 dB upon these sources are summarized in Table 1. Essentially, SELs can be reduced to the point that the radii of concern for marine mammals and turtles are within 10m or less for each type of pile to be used.

ii. While small, even with mitigation at the source there would remain a radius of potential effect on biota of concern within the harbor. Procedural mitigations would further reduce potential exposure to harassment levels; these measures could include working only during daylight hours, observing for protected species within affected zones before starting work (or prior to re-starting after 30 minutes of not working), and ramping up pile driving energies slowly to allow any animals within the zone to depart before criteria levels of sound energy are produced.

TABLE 1
Summary of Distances Exceeding Protective Noise Levels

ALTERNATIVES	RADIUS TO CRITERIA SEL (meters)					
	20" Concrete w/ cushion		**16" Concrete w/ cushion**		**12" Steel H**	
Distance to Harbor Entrance	Protected Species	SCUBA	Protected Species	SCUBA	Protected Species	SCUBA
	160 dB	154 dB	160 dB	154 dB	160 dB	154 dB
1. REPLACE						
Near: 305	54	136	34	86	9	23
Average: 427	54	136	34	86	9	23
Far: 518	54	136	34	86	9	23
2. EXPAND						
Near: 152	54	136	34	86	9	23
Average: 335	54	136	34	86	9	23
Far: 518	54	136	34	86	9	23
MITIGATION						
10 dB	11	29	7	18	3	5
20 dB	3	6	2	4	0	1

REFERENCES

1. Technical Memorandum; “Oregon LNG Terminal and Oregon Pipeline Project Underwater Noise Propagation, Monitoring and Mitigation”; Prepared for Oregon LNG by M. Bastach, PE, et.al.CH2M Hill; April 2008 revised April 2009

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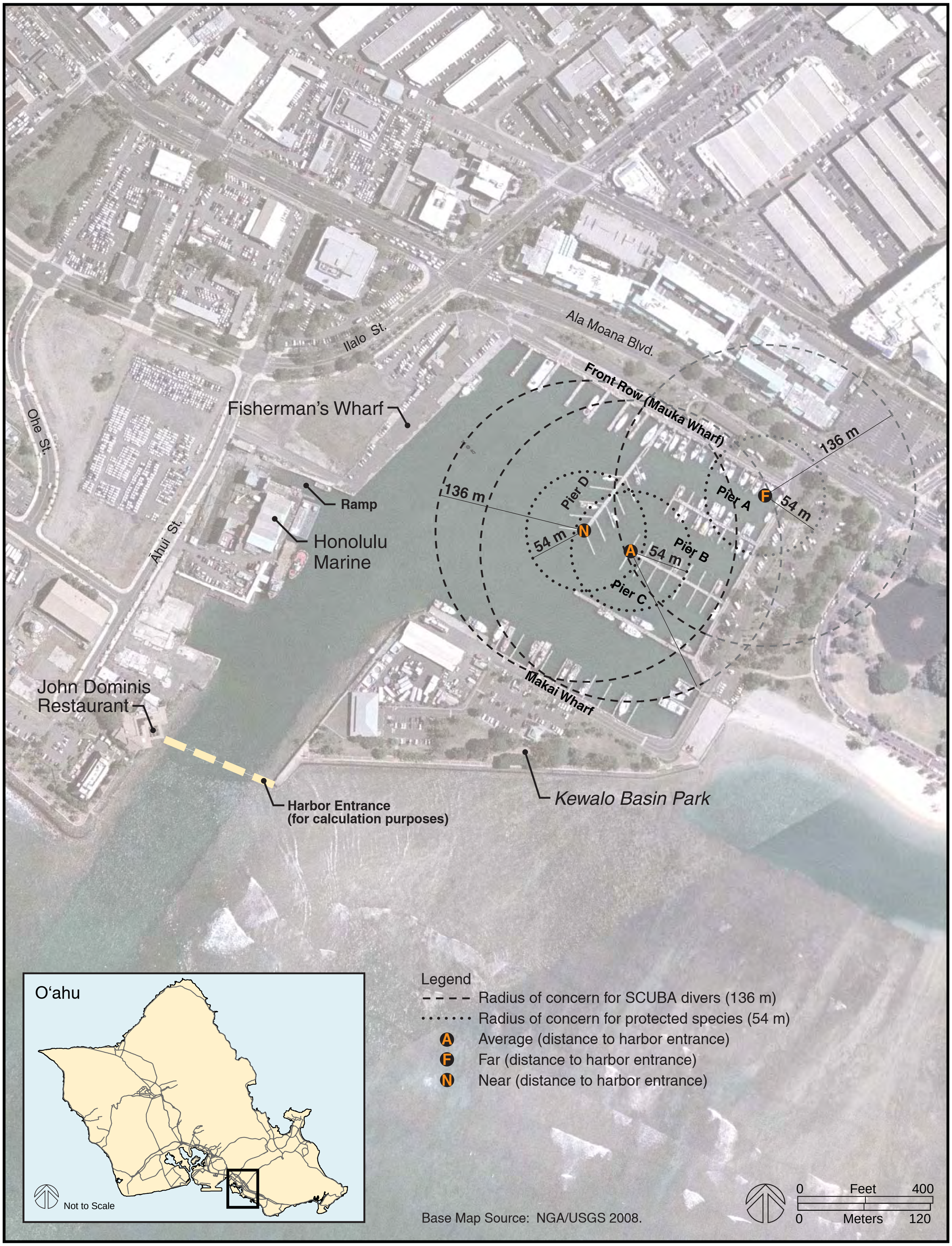
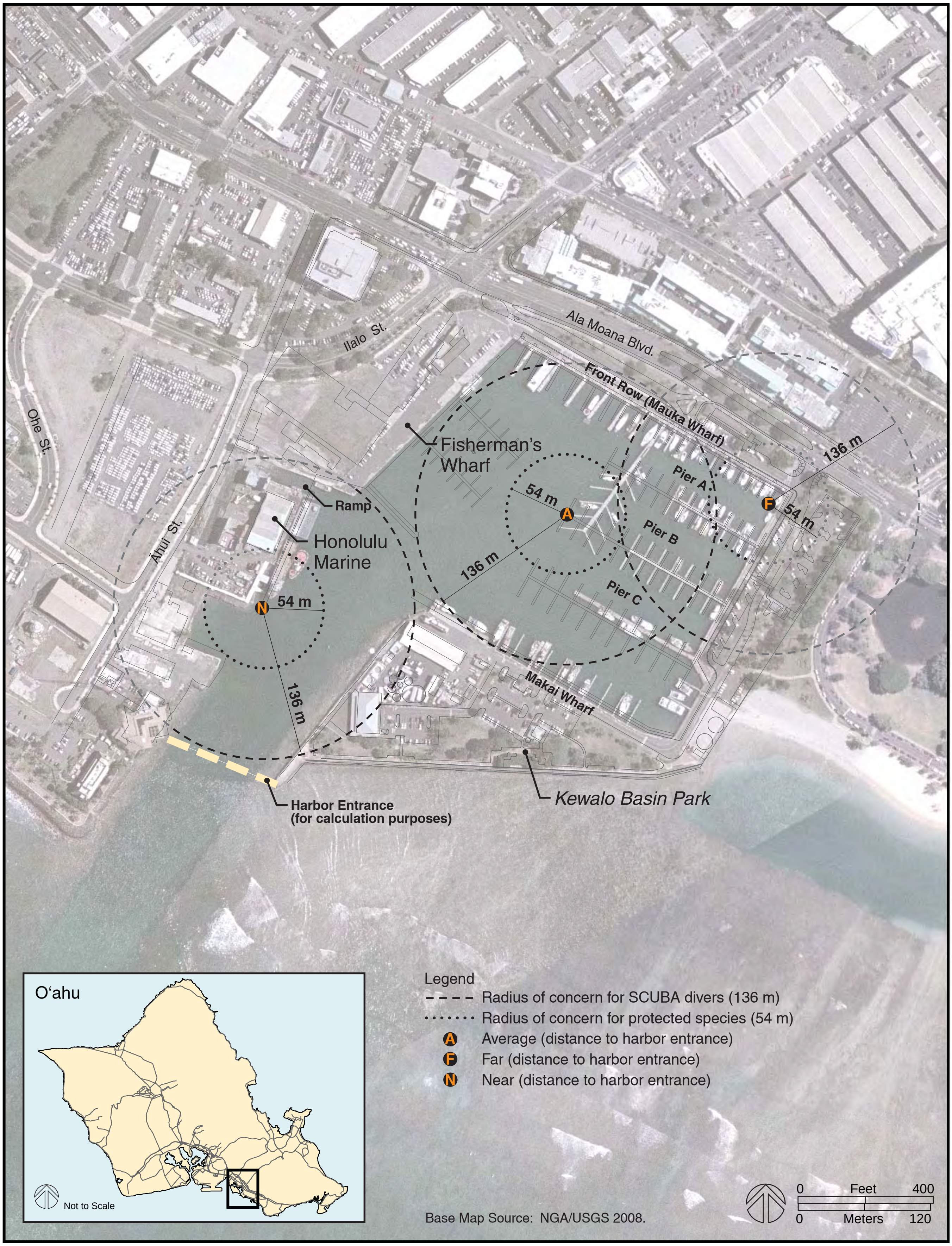


Kewalo Basin Repairs Project

Figure 1

Pier Replacement Underwater Noise Radii of Concern



Kewalo Basin Repairs

Figure 2

Pier Expansion Underwater Noise Radii of Concern

Hawai'i Community Development Authority

ATTACHMENT 1
Calculation Summary Sheet
20" Concrete Hexoganal Pile

Description	ALT 1: REPLACE AS IS		ALT 2: EXPANDED		Notes
	Given Value	Calculated Value	Given Value	Calculated Value	
Reference Noise Source	176	186	176	186	From published values for 24" concrete pile at 10m driven by diesel impact hammer with cushion block (Calfornia DOT). Calculated value is Sound Intensity Level in dB reference 1 micro Pascal at distance x=1 m. Pile: 20"/.501m concrete octagonal pile.
Calculated Noise Source	0.501		0.501		Root mean square Sound power (intensity) Level = I = 24.3XD(meters)+179 dB (rms ref 1microPa at 1 m). Assumed pile D=20"/.501m, taken at 1 m radius from source. (WDOT/Talisman)
RMS Pressure		191.17		191.17	Calculated Reference Sound Intensity D=20" / .501 m
Inside Harbor					Worst case assumed reference noise source
Radius to criteria value	186.00		186.00		I(x) = I(1 m)-TL (cylindrical spreading; absorbtion and scattering ignored). Cylindrical spreading occurs when water depth <200 m (US Navy). NMFS procedures for cylidrical spreading TL=15*LOG(x), vs TL=10Log(x). Using the 1.5 exponent, R(critical)=10^((I(source)-I(critical)/15).
Pinniped	160	54.12	160	54.12	
Cetacea	160	54.12	160	54.12	NMFS criteria value for harrassment of cetacea, pinnipeds and chelonia: 160 dB
Chelonia	160	54.12	160	54.12	
SCUBA	154	135.94	154	135.94	NSMRL advisory level: 154 dB
Values with Mitigation					
10 dB mitigation, protected spec.	160	11.66	160	11.66	meters
20 dB mitigation, protected spec.	160	2.51	160	2.51	meters
10 db mitigation, SCUBA	154	29.29	154	29.29	meters
20 db mitigation, SCUBA	154	6.31	154	6.31	meters
Outside Harbor, Unmitigated					
Distance to harbor entrance					From construction site locations based on existing pier locations
Near	305		152		meters
Average	427		335		meters
Far	518		518		meters
Calculated SIL, entrance	305	151.43	152	155.96	I(entrance)=I(1 m)-TL + Log(channel cross section in M^2) Creates new single noise source for estimating noise propogation outside harbor entrance. Cross section 82 m wide by 6 m deep. Worst case = nearest distance from source.
Radius to critical values					
Protected Species	160	N/A	160	N/A	meters
SCUBA	154	Below criteria	154	N/A	
SIL Entrance With Mitigation	305	141.43	152	145.96	Entrance composite SIL closest distance with 10 dB mitigation
10 dB Protected Species	160	N/A	160	N/A	Criteria value exceeds calculated composite value

Description	ALT 1: REPLACE AS IS Given Value	ALT 1: REPLACE AS IS Calculated Value	ALT 2: EXPANDED Given Value	ALT 2: EXPANDED Calculated Value	Notes
Reference Noise Source	173	183	173	183	From published values for 16" concrete pile at 10m driven by diesel impact hammer with wood block cushion(Calfornia DOT). Calculated value is Sound Intensity Level in dB reference 1 micro Pascal at distance x=1 m. Pile: 16"/.406m concrete pile with wood block cushion.
Calculated Noise Source	0.406		0.406		Root mean square Sound power (intensity) Level = I = 24.3XD(meters)+179 dB (rms ref 1microPa at 1 m). Assumed pile D=16"/.406m, taken at 1 m radius from source. (WDOT/Talisman)
RMS Pressure		188.87		188.87	Calculated Reference Sound Intensity D=16" / .406 m
Inside Harbor					Assumce reference noise source
Radius to criteria value	183.00		183.00		I(x) = I(1 m)-TL (cylindrical spreading; absorbtion and scattering ignored). Cylindrical spreading occurs when water depth <200 m (US Navy). NMFS procedures for cylidrical spreading TL=15*LOG(x), vs TL=10Log(x). Using the 1.5 exponent, R(critical)=10^((I(source)-I(critical)/15).
Pinniped	160	34.15	160	34.15	
Cetacea	160	34.15	160	34.15	NMFS criteria value for harrassment of cetacea, pinnipeds and
Chelonia	160	34.15	160	34.15	chelonia: 160 dB
SCUBA	154	85.77	154	85.77	NSMRL advisory level: 154 dB
Values with Mitigation					
10 dB mitigation, protected spec.	160	7.36	160	7.36	meters
20 dB mitigation, protected spec.	160	1.58	160	1.58	meters
10 db mitigation, SCUBA	154	18.48	154	18.48	meters
20 db mitigation, SCUBA	154	3.98	154	3.98	meters
Outside Harbor, Unmitigated					
Distance to harbor entrance					From construction site locations based on existing pier locations
Near	305		152		meters
Average	427		335		meters
Far	518		518		meters
Calculated SIL, entrance	305	148.43	152	152.96	I(entrance)=I(1 m)-TL + Log(channel cross section in M^2) Creates new single noise source for estimating noise propogation outside harbor entrance. Cross section 82 m wide by 6 m deep. Worst case = nearest distance from source.
Radius to critical values					
Protected Species	160	N/A	160	N/A	Below critical value
SCUBA	154	N/A	154	N/A	Below critical value
SIL Entrance With Mitigation	305	138.43	152	142.96	Entrance composite SIL closest distance with 10 dB mitigation
10 dB Protected Species	160	N/A	160	N/A	Criteria value exceeds calculated composite value

ATTACHMENT 3
Calculation Summary Sheet
12" Steel H Pile

Description	ALT 1: REPLACE AS IS		ALT 2: EXPANDED		Notes
	Given Value	Calculated Value	Given Value	Calculated Value	
Reference Noise Source	156	174.4	156	174.4	From published values for 12" steel H pile driven by diesel impact hammer at 70m (Calfornia DOT). Calculated value is Sound Intensity Level in dB reference 1 micro Pascal at distance x=1 m. Pile: 12" steel H pile.
Calculated Noise Source	N/A		N/A		Root mean square Sound power (intensity) Level = I = 24.3XD(meters)+179 dB (rms ref 1microPa at 1 m). Assumed pile D=16"/.406m, taken at 1 m radius from source. (WDOT/Talisman)
RMS Pressure		174.40		174.40	Calculated Reference Sound Intensity D=12" H pile
Inside Harbor					Assumce reference noise source
Radius to criteria value	174.40		174.40		I(x) = I(1 m)-TL (cylindrical spreading; absorbtion and scattering ignored). TL=10*LOG(x). Cylindrical spreading when water depth <200 m (US Navy). R(critical)=10^((I(source)-I(critical)/10)
Pinniped	160	9.12	160	9.12	NMFS criteria value for harrassment of cetacea, pinnipeds and chelonia: 160 dB
Cetacea	160	9.12	160	9.12	
Chelonia	160	9.12	160	9.12	
SCUBA	154	22.91	154	22.91	NSMRL advisory level: 154 dB
Values with Mitigation					
10 dB mitigation, protected spec.	160	2.75	160	2.75	meters
20 dB mitigation, protected spec.	160	0.28	160	0.28	meters
10 db mitigation, SCUBA	154	4.94	154	4.94	meters
20 db mitigation, SCUBA	154	1.06	154	1.06	meters
Outside Harbor, Unmitigated					
Distance to harbor entrance					From construction site locations based on existing pier locations
Near	305		152		meters
Average	427		335		meters
Far	518		518		meters
Calculated SIL, entrance	305	139.83	152	144.36	I(entrance)=I(1 m)-TL + Log(channel cross section in M^2) Creates new single noise source for estimating noise propogation outside harbor entrance. Cross section 82 m wide by 6 m deep. Worst case = nearest distance from source.
Radius to critical values					
Protected Species	160	N/A	160	N/A	Criteria value exceeds calculated composite value
SCUBA	154	N/A	N/A	N/A	Criteria value exceeds calculated composite value
SIL Entrance With Mitigation	305	129.83	152	134.36	Entrance composite SIL closest distance with 10 dB mitigation
10 dB Protected Species	160	N/A	160	N/A	Criteria value exceeds calculated composite value


Cover photo courtesy of Almar Management

D
Marine Biological Inventory

MARINE BIOLOGICAL INVENTORY

IN SUPPORT OF WHARF IMPROVEMENTS

FOR KEWALO BASIN, HONOLULU, HAWAI‘I

Prepared For:

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EALLC Report No. 2010-008
July 2010

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EXECUTIVE SUMMARY

Kewalo Basin Harbor was created by digging and dredging from the sea into old raised coral reef formations on land commencing in the late-1920's. By the mid-1950's most of the construction (bulkheads, etc.) had been completed. Storm drains discharge into the harbor and the elevation of the surrounding lands was raised using dredge spoils. To the west of Kewalo Basin is the Kaka‘ako Waterfront Park constructed on an old dump site and to the east is Ala Moana Park which was created using dredge spoils to cover an older shoreline dump site. Kewalo Basin was built for commercial use and commercial enterprise in the harbor continues to the present. Thus Kewalo Basin has received non-point source pollution from many sources since its construction.

Kewalo Basin presently encompasses 22 acres of submerged lands and has 143 slips as well as 9,160 lineal feet of moorage. Additional space for vessels is needed and it is proposed to increase the small craft moorage capacity of the existing Kewalo Basin Harbor. The proposed improvements include repair and/or replacement of the existing mooring infrastructure. These changes will encompass work on the piers only and no bulkhead changes are envisioned except to provide improvements to the existing utilities serving the piers. The project scope is limited to the submerged assets which includes anything within the water lot, up to and including the gangways to shore and utility connections. All work would take place within the existing harbor boundaries and no dredging is planned but pre-drilling and pile driving will be among the expected activities. On completion, the number of slips would increase by 75% (to 250 slips) and the total linear moorage capacity would be about 45% greater than at present (to approximately 13,100 lineal feet of moorage).

This study was undertaken to address concerns regarding possible impact occurring to marine communities both within and immediately seaward of the harbor if this proposed redevelopment of the harbor is undertaken. As part of this assessment, identification of any threatened and endangered (T&E) species and the resources utilized by these species which could be affected was also carried out. Finally, an assessment of Kewalo Basin Harbor as appropriate for Essential Fish Habitat (EFH) is discussed based on the findings of the inventory of extant biological resources in the area.

In summary, the biological resources in the Kewalo Basin project area have been greatly impacted by the many years of pollution and the documented increase in numbers and dominance of non-native species successfully colonizing the harbor. Much of the aquatic biota today is comprised of species with cosmopolitan distributions meaning that they are found in many harbors around the world. These species have become the visually-apparent dominant marine benthos in Kewalo Basin inner harbor/entrance channel and this fouling community is found on hard substratum (pier pilings, bulkheads as well as on refuse on the bottom). The soft-bottom substratum of the inner harbor bottom is a mix of mud, silt, muddy sand and refuse. Burrowing species are present in this soft bottom as noted by their holes. Very few fishes are seen in the inner harbor and other than the dominant alien black-chin tilapia, most of these are found in proximity to the harbor’s entrance channel. Thus the inner harbor is biologically degraded and few native species are present. The proposed redevelopment will negatively impact the alien-dominated hard bottom benthos present in the harbor during construction but once completed, will result in more hard substratum for settlement and growth in the form of additional pier pilings and floating piers. It is expected that these alien dominated benthic communities will continue to persist in the harbor following completion of the project.

The degraded conditions and marine communities common to the inner harbor continue in a seaward direction into the entrance channel. The first coral colonies to be seen are located 150 meters (m) seaward from the western end of the Makai Wharf along the eastern entrance channel wall and along the western channel wall fronting the John Dominis restaurant which is ~75 m seaward of the "Cove" along the western channel wall. It is not until one is 200 m or more seaward of these points that native coral reef species become apparent such that by 250 m seaward, the usual complement of Hawaiian coral reef species are dominant. Thus there is a substantial "buffer zone" between the inner harbor dominated by alien species where redevelopment will take place and the native coral reef communities which are located well seaward. The present survey of the harbor found no fish, shellfish or crustacean species of commercial or recreational importance within the inner harbor.

The effort to locate protected species noted one resident species, the Hawaiian green turtle in the waters offshore of Kewalo Basin. In total, five turtles were sighted with four of these being 400 m or more offshore of the shoreline fronting Kewalo Basin. One turtle was seen in the outer part of the Kewalo Basin entrance channel about 210 m seaward of the seaward boundary of the proposed project area. Green turtles are herbivorous and feed on algae or limu; a survey for algal forage species noted ample forage present in the waters fronting Kewalo Basin and adjacent to the east on the Ala Moana Beach Park reef flat. Potential impacts affecting green turtles include those from construction generated noise and turbidity. Calculated sound energy levels created by pile driving in Kewalo Basin were below the NMFS sound energy levels that constitute harassment to protected species outside of a 54 meter radius (Goody 2010). Since all proposed pile driving is well within the harbor (+ 150 m or more from the Harbor entrance channel), and protected species were not seen there in this study, construction noise should not be an issue to protected species. Furthermore, a study conducted offshore of West Beach, O'ahu, found that neither noise nor turbidity generated by use of dynamite and dredging had any negative impact on resident green turtles (Brock 1990). Rather, green turtles moved their resting habitat from one kilometer away to within 250 m directly offshore of the in-water construction activities once they commenced (i.e., moved closer). Thus it is concluded that the proposed construction activities will have no negative impact on resident green turtles.

Although there will be no dredging associated with the proposed project, pre-drilling and pile driving will occur. This and the removal of old pier piles will result in disturbance to harbor sediments which could release sequestered pollutants (i.e., petroleum products - oil and grease, metals - arsenic, chromium, copper, lead, zinc and mercury) into the water column potentially affecting all biological resources. However, the marine communities present in and adjacent to the harbor have had continuing exposure over the last 50 years to many of these same pollutants following heavy rainfall and runoff which enters the harbor via storm drains. Additionally, when larger vessels enter or exit the harbor, the thrust of the prop wash serves to stir the fine muddy substratum up into the water column. This potentially releases sequestered materials back into the water column as well as exposes benthic species to high transitory turbidity. Thus, the species present today tolerate these conditions and the expected impact of construction-related turbidity would be no different.

Kewalo Basin is situated in a marine setting, thus activities within it may impact Essential Fish Habitat (EFH). Potentially, many groups of marine organisms could be impacted including Bottomfish, Crustaceans, Precious Corals, Pelagic Species and Coral Reefs all of which are federally-managed under their respective Fishery Management Plans (FMP's). In the case of the proposed Kewalo Basin redevelopment, the adjacent EFH waters (outside of the harbor) are marine with the usual suite of coral-reef species present. However within the biologically-degraded harbor (as report herein), there are few native species present that are potentially affected by the proposed action. The marine communities in Kewalo Basin are dominated by a suite of alien species which due to their superior competitive abilities and life history characteristics allows these alien species to tolerate highly disturbed and polluted environments (such as Kewalo Basin), resulting in very few native species being readily apparent in the harbor. These physical and biological conditions continue well seaward of the proposed area for redevelopment into the entrance channel, which may serve as a buffer for the native communities found further seaward. Given these present conditions, Kewalo Basin does not serve as EFH for any coral reef species of commercial, recreational or ecological importance.

In summary, the proposed redevelopment of Kewalo Basin will have little negative consequence to native marine species because the affected benthic communities are dominated by alien species that have broad geographic distributions. The proposed activities are occurring in a highly degraded environment with poor biological resources which, following completion of the work, will undoubtedly re-establish themselves on the new substratum created by the redevelopment. In the long term, the suite of species now in the harbor will continue to persist.

INTRODUCTION

1. Background/Project Description

Kewalo Basin in Honolulu was constructed in the 1920's to ease the congestion occurring in Honolulu Harbor and to provide docking for lumber schooners. The harbor encompasses about 55 acres. By the time the concrete wharf was finished in 1926, lumber schooners had begun to fade out and by 1929 commercial fishing operations moved into the harbor. The bulkhead forming the mauka side of the harbor was constructed between 1928 - 1934. During WWII the harbor basin was dredged and expanded and by 1951 the Waikiki bulkhead was completed. In 1955 about eight acres of filled land was created along the seaward or makai side of the harbor to form a peninsula protected by a basalt rock revetment. From the mid-1950's into the mid-1980's various improvements were made to Kewalo Basin's piers and the surrounding infrastructure.

Today, Kewalo Basin encompasses about 22 acres of submerged lands and includes approximately 143 slips and 9,160 lineal feet of moorage. The proposed improvements include repair and/or replacement of the existing mooring infrastructure. These changes will include work on the piers only and no bulkhead changes are envisioned except to provide improvements to the existing utilities serving the piers. In general, the work will involve developing the existing Kewalo Basin Harbor to increase the small craft moorage capacity. The project scope is limited to the submerged assets which includes anything within the water lot, up to and including the gangways to shore and utility connections. All work would take place within the existing harbor boundaries and no dredging is planned but predrilling and pile driving will be among the expected activities.

The final build-out of the harbor will be new construction, but the work will be phased over the next several years to meet budget programming, and will include a combination of:

- Repairs to the existing dock (mostly concrete repairs to the topsides);
- Demolition of the existing fixed piers;
- Addition of new piers of either floating or fixed construction or both;
- New water/electrical/sewer utilities throughout the basin.

The preferred alternative would increase the number of slips by about 75% and increase the total linear moorage capacity by about 45% (to 250 slips and approximately 13,100 lineal feet of moorage). The proposed full build-out development will include the demolition of all existing in-water infrastructure, including Piers A, B, C and D, as well as the front row of commercial vessel slips adjacent to Ala Moana Boulevard, and the makai long dock slips (i.e., Makai Wharf). The existing piers A, B, C alignments will be replaced by longer piers and the front row slips will be reconstructed. The makai long dock slips will be replaced by a longitudinal berth adjacent to the wharf. A fueling dock is proposed, extending ewa from the existing Makai Wharf into the harbor channel. The proposal includes two new piers for small to medium-sized vessels and a single jetty pier on the Fisherman's Wharf side of the harbor. Upland work will be limited to utility trenching that may be necessary for utility improvements; however these are expected to be limited to the areas directly adjacent to the existing piers.

The scope of this study is as follows. Since there is expected in-water demolition and construction, a survey of marine communities in the affected area as well as seaward of it (i.e., the harbor channel) was conducted. Besides noting the status of these marine communities herein, an assessment of impacts to these communities by the proposed construction and later harbor operation activities is also addressed. As part of this assessment, identification of any threatened and endangered (T&E) species or otherwise protected species as well as any resources that those species utilize in the project area was conducted. This effort includes an assessment of impacts to T&E species including those during construction (such as acoustical impacts due to pile driving) as well as following completion of these activities (during operations) where increased vessel traffic is expected. Besides identification of potential and cumulative impacts to these marine resources, identification of appropriate mitigation measures is addressed herein. Finally, an assessment of Kewalo Basin Harbor as appropriate for Essential Fish Habitat (EFH) is discussed.

There has been one previous inventory made of the biota in Kewalo Basin. Coles *et al.* (1999b) found 211 different taxa (165 named) in the inner part of Kewalo Basin. Coles *et al.* (1999b) This survey collected samples from the fouling communities and soft-bottom benthos and collected these samples at four stations in the inner harbor. Considerable effort was made to find all species present requiring the use of microscopes in the laboratory, thus the infauna and cryptofauna were well sampled. However, complete taxonomic identifications for all species are especially difficult with some of the smaller forms, resulting in incomplete identifications for some specimens. Since not all specimens collected could be identified to the species level, the term "taxa" was used. The Coles *et al.* (1999b) survey of Kewalo Basin found 10 algal species (five named), 12 sponges (five named), six cnidarians (four named), 28 annelids (16 named), 26 mollusks (19 named), 65 arthropods (57 named), two sipunculians (both named), 18 bryozoans (16 named), two named echinoderms, 16 ascidians (14 named) and 26 fish species (25 named). Higher numbers of taxa were found at the station in closest proximity to the harbor mouth (survey station 21). Coles *et al.* (1999b) noted that 49 species or 27% of the total in Kewalo Basin were non-native (either cryptogenic and/or introduced). Thus alien species are an important component of the marine communities in Kewalo Basin.

MATERIALS AND METHODS

Kewalo Basin Harbor has a water surface area of approximately 22 acres. Past marine biological work in many Hawaiian harbors has, in general, noted a poor quality habitat with many of the dominant species being non-native. Thus, field methods used here focus on sampling communities present at several different locations within the harbor. The communities present are related to the kind of substratum present; hard substratum is usually covered with a fouling community and the harbor bottoms are usually comprised of fine, silt/mud substrates often with considerable refuse present and having a few burrowing species present. Related to the paucity of appropriate hard substratum and shelter across the harbor floor, native fishes are not a common feature in the inner reaches of many harbors. The methods used here are designed to allow an inventory of the visually-apparent dominant species present at selected locations hence there is a focus on visual assessments of the intertidal and subtidal fouling communities resident to the pier pilings and bulkheads, a visual appraisal of macrobiota found on the sand/mud/silt substratum, and an assessment of any mobile species occurring at the sample sites. It should be noted that many invertebrate species that are found in marine fouling communities are small and usually cryptic (i.e., concealed) thus requiring the collection of samples and conducting a search through sample material using a microscope. Since the objective of this study is to conduct an inventory of the diurnally-exposed, visually dominant species, the primary focus was on those species and not on the small cryptic species. Where larger species could not be identified, material was collected in the field for species confirmation in the laboratory. These fouling community samples were collected by scraping material into labeled sample jars and preserving the material for subsequent identification. Besides the in-water work, time was spent walking on piers and along bulkheads, noting the presence of species seen on the hard substratum and in the water column as viewed from the shoreline.

Examination of marine communities was carried out both within the harbor proper and also in the entrance channel and seaward areas and carried out between 23 February - 30 March 2010. The entrance channel was examined with SCUBA, swimming along both the eastern and western sides covering the entrance channel sides from the channel bottom to the upper channel edge and noting all diurnally-exposed species present.

With respect to the occurrence of threatened and endangered species, a number of regular ocean users (surfers, fishermen and divers) were interviewed prior to the in-water field work about the presence and distribution of T&E species along O'ahu's inshore area, including green sea turtles and other protected species (i.e., mammals). Major surf sites are located on either side of the Kewalo Basin Harbor entrance channel ("Kewalos" on the east side and "Point Panic" on the west) thus many regular users are familiar with these areas which could be used by green sea turtles. This information served as the basis for our further field investigation on the presence and use of resources seaward of the harbor by T&E species. This work was carried out by observing the water's surface from a vessel, looking for and noting the presence of any green turtle surfacing for air. This method allows one to find the areas used for diurnal resting. Once identified, diving with SCUBA on these areas was carried out to identify the number of turtles present, their approximate sizes and the presence/absence of tags or tumors. Additional work focused on the presence/absence of appropriate turtle algal forage in the shallower waters shoreward of the resting sites.

RESULTS AND DISCUSSION

1. Station Locations

A. Inner Harbor

Four sample sites were selected in Kewalo Basin Harbor to assess the marine communities present (Figure 1). Three of the four stations were approximately in two of the same locations sampled by Coles *et al.* (1999b) thus providing some comparative assessment of the communities sampled at those sites sampled twelve years apart. The major substratum types found in Kewalo Basin include sand/mud which is the dominant substratum and hard substratum comprised of submerged portions of steel bulkheads, concrete piles and refuse on the bottom (shopping carts, bicycles, tires, etc.). At each of the four stations, these major substratum types were sampled. Besides these four locations, a visual inspection from land was made of the bulkheads and piers around the harbor noting all marine species seen within the harbor. For the purpose of this discussion the “harbor” is defined as that area shoreward or mauka of the entrance channel; the entrance channel (discussed below) is defined as the channel connecting the harbor with the open sea. The inner boundary of the entrance channel is defined here as that area seaward of an imaginary ~150-meter long line drawn from the west side of the Makai Wharf (which is located on the seaward peninsula of the harbor) in a northwest direction across the entrance channel to the inner (mauka) east corner of the “Cove” (see Figure 1). The channel area seaward of this is discussed separately from the inner harbor because the two areas have very different marine communities present.

The inner harbor station descriptions are as follows:

Station 1: Located along the bulkhead in eastern inshore corner of the harbor between Pier A and the innermost corner. The depth at this station is about 3 m with a fine sand/shell/mud substratum that slopes down to about 4 m towards the central part of the harbor. Visibility was less than 2 m at this site. Marine fouling communities were examined along the bulkhead and on the fine sand/mud substratum nearby. Years ago MacWayne’s Marine Supply was located just east of this site. In addition, near the inner eastern corner of the harbor is an old pipe connecting the lagoons and ponds of Ala Moana Park to the harbor. Approximately 12 m along the bulkhead and associated pier pilings were examined along with the mud/sand substratum below them. This station as well as station 2 below approximately duplicates Coles *et al.* (1999b) survey station 24.

Station 2: Examined several pier pilings along Pier A located from 20 to 40 m away from Station 1. Samples were taken from these fouling communities. The substratum around these pilings were comprised of a mix of sand and mud with visibility less than 2 m. Water depth about 4 m and five pier pilings were examined as well as the mud substratum beneath. This station also approximately duplicates Coles *et al.* (1999b) survey station 24.

Station 3: Six pier pilings at the end of the herringbone pier spaced over a distance of ~30 m and vicinity as well as the sand/mud and refuse substratum beneath them were examined. Again samples of the fouling community were collected at this site; depth was about 5 m and the visibility was 3 to 4 m.

Station 4: An examination of the bulkhead and ten pier pilings along approximately 140 m of the western edge of the harbor from the inner western corner to a point 140 m seaward. The sampling effort was much greater at this station than at the other three due to the fact that there is a greater diversity of species present. This section of wharf fronts the old Fisherman's Wharf restaurant and the location of the former Hawaiian Tuna Packers plant. This station roughly duplicates two of the survey sites (numbers 21 and 23) sampled by Coles *et al.* (1999b). Again samples of the fouling community were collected for later identification. Water depth is about 6 m along the more seaward portion of this site and about 4 m in the inner western corner and visibility ranged from about 3 to 7 m. The substratum ranges from muddy sand in the inner corner where a stormwater drain is present to a more sand/rubble/mud substratum in the more seaward areas. Refuse on the bottom (tires and shopping carts) were also examined. The docks extend close to 10 m into the harbor from the bulkheads and are supported by numerous concrete pilings which were also examined and sampled.

B. Harbor Entrance Channel

As noted above, the entrance channel is defined as the channel connecting the harbor with the open sea. The inner boundary of the entrance channel is defined here as that area seaward of an imaginary 150-meter long line drawn from the west side of the Makai Wharf (which is located on the seaward peninsula of the harbor) in a northwest direction across the entrance channel to the eastern mauka corner of the "Cove". The outer limit of the entrance channel examined in this study is defined as an imaginary line drawn from Buoy 3 - which is located on the western side of the channel - to a point directly across the channel mouth (east) of the buoy (corresponds to solid lines along the sides of the channel in Figure 1). Since the harbor and entrance channel are in near-constant use during daylight hours, the in-water observations were restricted to the east and west sides of the channel. Most cover (shelter) is found along these sides and not in the middle of the channel. The channel edges were examined using SCUBA and all diurnally-exposed coral reef species present were noted. This survey covered the channel walls commencing at the inner western corner of the Makai Wharf swimming seaward for approximately 450 m to a point opposite Buoy No. 3 located on the western channel edge. The divers then re-entered the water at Buoy 3 swimming ~420 m shoreward to the inner harbor boundary located at a point fronting the Honolulu Marine, Inc. Shipyard (see Figure 1).

C. Seaward of the Harbor

Since there is concern over the possible presence of T&E and other protected species within the project site boundaries as well as in the adjacent waters seaward, an effort was made to examine the offshore waters fronting Kewalo Basin for the presence of such species. The most common threatened and endangered species in Hawaiian inshore waters is the green sea turtle (*Chelonia mydas*). Green sea turtles frequently rest on the bottom during the day and feed on algae (or limu) during the hours of darkness inshore of the resting areas. Green turtle resting sites are generally in areas of high relief (on hard substratum) or directly adjacent to it. Thus, efforts to locate sea turtle resting sites are usually focused in these areas. Since green turtles are known to frequent the waters offshore of Kewalo Basin, an effort was made to locate resting areas from the surface vessel as well as observe these turtles underwater. In general, the submarine topography offshore of Kewalo Basin and to the west of it is dominated by hard limestone substratum which commences at the shoreline and continues seaward to about the 10-12 to 22 m isobath where it terminates in a series of limestone ridges and adjacent channels oriented perpendicular to shore (i.e., spur and groove system). Seaward of this a sand/rubble bottom is encountered which continues to deeper depths. On the eastern side of the Kewalo Basin entrance channel the offshore sand is found at ~ 12 m and on the western side of the channel it commences at ~22 m. Since most of the cover or shelter for green turtles is on hard substratum, this study examined the hard bottom areas on both sides of the Kewalo entrance channel. The area examined on the eastern side of the entrance channel extended from the seaward edge of the shallow reef that bares at low tide to the western edge of Ala Moana Park and to a point approximately 300 m seaward (where the sand bottom is encountered). West of the Kewalo Basin entrance channel, the area examined extended from the shoreline to a point 185 m west (to an abandoned sewer discharge pipe) and 470 m seaward to the 22 m isobath. These two areas are shown in Figure 1 and encompass approximately 7.3 hectares (ha) on the west and 12.9 ha on the east side of the entrance channel. In addition, an underwater traverse with SCUBA was made through the area of greatest cover looking for turtles.

During field work, efforts were made to visually locate any protected marine mammals from the dive vessel in the vicinity of Kewalo Basin. During underwater work, efforts were made to "hear" the songs of humpback whales that may be passing well seaward of Kewalo Basin. Humpback whales are in Hawaiian waters during the October - April period.

2. Biological Results

A. Species Encountered Within Kewalo Basin Inner Harbor

In addition to the inventory of marine species present in the inner harbor, an effort was made to categorize species encountered into one of three groups: (1) those that are native (species that occur in Hawai'i naturally), (2) nonindigenous (or introduced) species or (3) cryptogenic species which are species of uncertain origin but with indications of being introduced following the designations in Eldredge and Carlton (2002) and Coles *et al.* (1997, 1999a, 1999b). This was done because the present study was undertaken to define impacts that may occur with the proposed construction and operation of improvements in Kewalo Basin on the species resident to the harbor. If the marine communities that will be disturbed by the proposed development are largely comprised of non-native species, impacts may be of lesser concern relative to those occurring to marine communities comprised of native species. Non-native marine species usually have wide geographical distributions (frequently pan-tropical) and are often competitively superior occupiers of space (and other resources) which are at a premium in benthic fouling communities. Thus these alien species often dominate the aquatic communities in which they are found. In addition, many non-native species are able to tolerate the ecological conditions as found in degraded habitats which are the conditions usually seen in inner harbor areas.

Four stations established in Kewalo Basin were examined on 23 February 2010. The results of this inventory are given in Table 1. Referring to Table 1, there were 58 species encountered among the four stations. Twenty-four of these species or 41% species are introduced or cryptogenic. Thirty-four of the 58 species, or 59% are native. In general, the most visually-apparent species at the four stations in the fouling community found on pier pilings and/or bulkheads were alien forms. Although present in the fouling community, most native species were not readily apparent due to their much lower coverage and/or abundance. More species were found at Station 4 which is in closest proximity to the harbor entrance channel but the sampling intensity was greater at Station 4 than at any of the other stations.

Sixteen species of fishes were seen in the harbor and all but one (the black-chin tilapia, *Sacotherodon melanotheron*) were native. The alien tilapia was by far the most common species seen in the harbor, and were most apparent when viewed from above while walking around the perimeter of the harbor. The tilapia were wary of divers and few individuals were seen during the underwater surveys. Most of the native fishes were found around the shelter afforded by pier pilings, under the wharves or around larger refuse on the adjacent bottom that had been thrown into the harbor (shopping carts, bicycles, etc.). None of the native fish species were common in the inner harbor, so most sightings at a station were comprised of one or two individuals. Most fishes seen were either juveniles or subadults (other than tilapia).

Nine algal species were identified in this study; these algae were most apparent near the air-water interface (i.e., the lower intertidal) except for the red coralline, *Mastophora pacifica*, which occurred lower on the pier pilings. One of the nine algal species, *Acanthophora spicifera*, is introduced and the remainder (eight) are native species.

The only other major phyletic group given in Table 1 that were primarily comprised of native species (i.e., did not have any or few introduced or cryptogenic species) were the arthropods including two native shrimp and three crab species. Otherwise, the other phyla (i.e., Porifera or sponges, Cnidaria or coelenderates, Annelida or worms, Mollusca or shells, Ectoprocta or bryozoa and the lower Chordata or tunicates) were dominated by non-native species (Table 1).

As noted above, Coles *et al.* (1999b) found higher numbers of taxa at the station in closest proximity to the harbor mouth (survey station 21) which is similar to the findings of the present study. Coles *et al.* (1999b) also noted that 49 species or 27% of the total found in Kewalo Basin were non-native (either cryptogenic and/or introduced) which is 14% less than the findings of the present study twelve years later. The increase in the number of non-native species found by the present study is probably due to the much more detailed and complete sampling carried out by Coles *et al*. (1999b). The Coles *et al.* (1999b) survey found many small cryptic and infaunal species which are native in origin. In contrast, many of the visually-dominant species in the inner harbor are alien. These alien species are competitively superior in occupying much of the available hard substratum, either by sheer abundance or by being fast-growing colonial forms. As a result, more of these larger alien species were recorded in the present study. Thus differences in sampling methodology may account for the differences in the percentage of alien species relative to the total number of species recorded.

In recent years there has been considerable worldwide interest in the apparent declines in the resources found on coral reefs. Studies have linked a myriad of natural and anthropogenic factors to these declines which has resulted in efforts by the regulatory community to better protect corals and other resources found in these habitats. Regulatory agencies are particularly concerned about the status and protection of corals. Thus as part of the inventory of aquatic resources in Kewalo Basin, an effort was made to document the presence of corals in the harbor. Within the inner harbor, no corals were seen. The coral, *Porites lobata*, was noted at the most seaward station (Station 21 at the makai end of the old Fisherman's Wharf) by Coles *et al.* (1999b). Unfortunately, Coles *et al.* (1999b) did not record the abundance of the species seen, so it is unknown if more than one specimen was present in their samples. It is important to note that no corals were seen in this same general area during our surveys in 2010.

There has been a twelve-year hiatus between the detailed work by Coles *et al.* (1999b) in Kewalo Basin and the present inventory. Over this twelve-year period there have undoubtedly been some changes in the biota of the harbor. Coles *et al.* (1999b) found tilapia in Kewalo Basin which was identified as *Oreochromis mossambicus* or the Mozambique tilapia. The present study did not find *Oreochromis mossambicus* but did find the black-chin tilapia, *Sarotherodon melanotheron* in abundance. The black-chin tilapia is sometimes referred to as the salt-water tilapia and was brought into Hawai'i in 1965 as a possible bait fish for the skipjack tuna industry. It escaped and today is the most abundant species of tilapia in Hawai'i having displaced the previously ubiquitous *Oreochromis mossambicus* (Yamamoto and Tagawa 2000). It is very probable that the relative abundance/coverage by some of the competitively superior sessile (i.e., attached or fixed to the substratum) alien species in the harbor has increased over the twelve-year period thus increasing their dominance as recorded here.

B. Species Encountered in the Kewalo Basin Entrance Channel

Besides the examination of marine communities within the inner harbor, an effort was made to inventory the marine communities present in the Kewalo Basin entrance channel. Because the inner harbor is visually-dominated by non-native or alien species and working in the entrance channel with vessel traffic is hazardous to divers, emphasis was placed on noting the presence of native coral and reef fish species occurring along the channel sides. The entrance channel was examined with SCUBA, swimming along both the eastern and western sides covering the entrance channel sides from the channel bottom to the upper channel edge and noting all diurnally-exposed native species present. Along the eastern side of the entrance channel, the swim commenced at the inner western corner of the Makai Wharf moving in a seaward direction to a point approximately 450 m offshore which is roughly opposite of Buoy No. 3 marking the western side of the entrance channel. The divers then re-entered the water next to Buoy No. 3 on the western side of the entrance channel and swam ~420 m in a shoreward direction to a point fronting the Honolulu Marine Inc.'s Shipyard (see Figure 1).

In general, the diversity of native species increases dramatically as one moves seaward; this is shown in Table 2. Since this effort was done in a single pass along each of the channel edges, the data in Table 2 are presented in arbitrary approximate 100 m distances to a point where the marine communities are dominated by the usual expected array of Hawaiian fishes and corals. This was done to demonstrate the transition from the highly disturbed inner harbor fauna dominated by non-native species to the "normal" suite of Hawaiian coral reef species found further offshore. The first coral colony encountered (a small colony of *Pocillopora damicornis*) along the eastern channel wall was seen about 150 m seaward of Makai Wharf. Neither corals nor fish become important components until reaching the seaward end of the boulder riprap on the eastern side which is approximately 210 m seaward of the Makai Wharf. Further seaward, fish and coral communities are well-developed. On the western side of the entrance channel, a similar increasing diversity is seen in the coral and fish communities in a seaward direction. Along the western channel edge these diverse communities continue in a shoreward direction on and adjacent to the boulder riprap to a point fronting the University of Hawai'i Pacific Biomedical Research Center (Kewalo Laboratory) where at approximately 180 m inshore of Buoy 3 the diversity diminishes. Roughly within the next 75 m shoreward (fronting the mauka boundary of the John Dominis Restaurant), corals are not seen and the inner harbor marine communities become more apparent.

In summary, the highly disturbed, alien-dominated benthos and fish community of the harbor continues unchanged to a point 150 m seaward of the Makai Wharf on the eastern wall of the entrance channel and on the western side, to a point fronting the mauka boundary of the John Dominis Restaurant. Seaward of this, the marine communities change rapidly to the usual suite of Hawaiian reef species reflecting the improving quality of the habitat in a seaward direction. Thus the seaward boundary for the proposed improvements in Kewalo Basin is well inshore of the coral reef communities dominated by native species suggesting that direct impacts due to construction will occur only to a presently highly disturbed benthic community dominated by alien species.

C. Protected Species Encountered Seaward of the Entrance Channel

As noted above, the submarine topography offshore of Kewalo Basin and to the west of it is dominated by hard limestone substratum which commences at the shoreline and continues seaward to about the 12 m isobath on the eastern side of the entrance channel and to a depth of 22 m on the western side of the channel. Seaward of this a sand/rubble bottom is encountered which continues seaward from that point. On the east side of the entrance channel this sand bottom is encountered about 570 m offshore and on the western side, it is about 470 m seaward of the shoreline. Since green sea turtles usually select resting sites on or directly adjacent to hard substratum, efforts were made to locate resting sites by making observations from a vessel slowly traversing the area of hard bottom looking for turtles surfacing for air. These traverses were carried out along three approximate isobaths: 4-6 m, 8-10 m, 12-20 m. The areas encompassed in this effort were as follows: on the eastern side of the entrance channel, the area examined extended from the seaward edge of the shallow reef which bares at low tides to the western edge of Ala Moana Beach Park and seaward to a point approximate 300 m seaward (where the sand bottom is encountered). West of the Kewalo Basin entrance channel, the area examined extended from the shoreline 185 m west to the abandoned sewer discharge pipe and 470 m seaward to the 22 m isobath. These two areas are shown in Figure 1 and encompass approximately 7.3 ha on the west and 12.9 ha on the east side of the entrance channel. In addition, an underwater traverse with SCUBA was made through the area of greatest cover looking for turtles.

Because of low population numbers, the Hawaiian green sea turtle (*Chelonia mydas*) was given protected status by being listed as a "Threatened Species"under the U.S. Endangered Species Act in 1978. Green turtles as adults are known to forage and rest in the shallow waters around the main Hawaiian Islands. Reproduction in the Hawaiian population occurs primarily during the summer months in the Northwest Hawaiian Islands (now the Papahanaumokuakea Marine National Monument) with adults migrating during the early summer to these isolated atolls and returning in the late summer or early fall. In the main Hawaiian Islands, green turtles rest along ledges, caves or around large coral mounds in coastal waters usually from 15 to 20 m in depth during the day. Under the cover of darkness, turtles will travel inshore to shallow subtidal and intertidal habitats to forage on algae or limu (Balazs *et al.* 1987). The normal range of these daily movements between resting and foraging areas is about one kilometer (Balazs 1980, Balazs *et al.* 1987). In general, appropriate algal forage for these turtles is found in shallow waters inshore of the resting areas. Selectivity of algal species consumed by Hawaiian green turtles appears to vary with the locality of sampling, but stomach content data show the alien *Acanthophora spicifera* and native *Amansia glomerata* to quantitatively be the most important (Balazs *et al.* 1987); the preferences may be due to the ubiquitous distribution of these algal species.

The Hawaiian green turtle population has rebounded under the close to 40 years of federal protection afforded to it such that today, green turtles are commonly seen in the waters fronting most beaches around the islands. In contrast, the hawksbill turtle (*Eretmochelys imbricata*) is much less common and much less is known about its biology in Hawaiian waters. Hawksbill turtles do not attain the size of green turtles in Hawaiian waters, nest on very small and isolated beaches around the main islands and are omnivorous in their feeding habits. The hawksbill is also protected under federal and state law as an endangered species. In the present survey of Kewalo Basin and the waters seaward of it, no hawksbill turtles have been seen.

The method for locating green turtles in their resting areas is to observe the water's surface from a vessel noting when and where a turtle might surface for air. Once located, continued observation of the general area will (1) suggest to the observer if the area is a resting area by the repeated presence of turtles on the surface, and (2) provide a rough idea of how many turtles may be present in the resting area. Sometimes a single turtle may be seen momentarily on the surface and not seen again. In this case, the individual turtle may be just swimming through and not occupying a resting site. Confirmation of resting sites can be made using SCUBA to observe turtles on the bottom at rest. Often if resting areas are routinely used by turtles, the hard substratum will have a “worn” or “smoothed” appearance due to their shells abrading against the bottom as they rest.

Two “in-water” field surveys utilizing a support vessel were carried out in this study; the primary focus of the 23 February 2010 survey was to sample the marine communities in Kewalo Basin and the entrance channel and the second survey on 30 March 2010 focused on delineating the presence of protected species in the waters seaward of the harbor.

On 23 February 2010 while transiting to Kewalo Basin, two green turtles were seen. The first was well outside of the harbor, more than 500 m offshore of the shoreline and approximately 400 m southeast of the eastern edge of the entrance channel (approximately at 21°17'10.27"N, 157°51'30.86"W) and had an estimated straight-line carapace length of 65 cm. The surf along the south shore of O’ahu at this time was from 0.6 to 0.9 m thus much of the shallows fronting Kewalo Basin was covered with white water. The first turtle observed was seaward of the breaking surf in water with a depth of 6 to 8 m. The second turtle observed was seen momentarily on the surface along the eastern side of Kewalo Basin entrance channel at the seaward end of the boulder riprap as the vessel was entering the harbor. This turtle had an estimated straight-line carapace length of 60 cm. Later that same day during the underwater survey of the eastern and western edges of the harbor entrance channel, two undercuts in about 6 m of water were found along the eastern edge of the channel that appeared to be “worn” down as described previously suggesting that these areas may be used by green turtles as resting sites. Both of these possible resting sites as well as the second turtle seen earlier in the day were located along the channel wall at the seaward end of the boulder riprap which is approximately 210 m seaward of the proposed project seaward boundary (roughly at 21°17'26.61"N, 157°51'34.08"W).

On 30 March 2010, a field survey was undertaken specifically to look for green turtles seaward of Kewalo Basin. Observations were made looking for turtles surfacing for air. Three turtles were seen with two of them located east of the harbor entrance channel and one located to the west. As previously noted, the area examined covered approximately 20 ha. During the surface search, the vessel moved slowly from southeast to northwest traversing the area, then returned on a different track. Three such tracks were made along the 4-6 m, 8-10 m and 12-20 m isobaths fronting Kewalo Basin and to the west as far as the abandoned sewage discharge pipe offshore of the Kaka’ako Waterfront Park (former Kewalo Landfill). The abandoned sewage discharge pipe is located approximately 185 m northwest of the western edge of the Kewalo Basin entrance channel. The first turtle encountered had an estimated straight-line carapace length of 75 cm and was located about 450 m offshore of Kewalo Basin in about 11 m of water (located approximately at 21°17'08.70"N, 157°51'37.61"W) and about 270 m from the eastern edge of the entrance channel. Shortly thereafter a second turtle with approximately the same carapace size was seen about 50 m southwest of the previous turtle (at ~21°17'07.15"N, 157°51'37.57"W). Water depths were estimated to vary between 9-12 m and it was assumed that both of these turtles were resting at their respective locations. Finally, a third turtle was seen on the surface having an estimated straight-line carapace length of 70 cm and was located 70 m west of the western edge of the entrance channel more than 420 m offshore (~21°17'14.18"N, 157°51'50.31"W) of the shoreline fronting the Kewalo Laboratory. These turtles were all located well-offshore (more than 400 m from the shoreline) and well outside of the harbor.

As part of the green turtle census work on 30 March, two divers equipped with SCUBA and carrying a float were dropped in the ocean ~ 500 m offshore and 375 m southeast of the eastern edge of the entrance channel (at about 21°17'11.44"N, 157°51'30.08"W). The survey vessel followed the float and the divers moved across the well-developed "spur and groove" formations that mark the seaward edge of the emergent limestone reef which continues shoreward from that point. Seaward of the spur and grooves the substratum is primarily sand which continues offshore to below diving depths. The divers swam towards the entrance channel (northwest direction) examining the edges of the emergent limestone for the presence of possible turtle resting sites through a depth range from about 6 to 12 m. In general, the limestone spurs or ridges project seaward on scales of 20 to 100 m and rise above the sand up to 4 m (Figure 2). These ridges are from 5 to 35 m across (Figure 3) and are spaced from 5 to 50 m apart. In the traverse across these ridges and around some of them, numerous undercuts and small caves were examined (Figure 4) but no green turtles were seen nor were any sites with apparent "worn" or "smooth" substratum (which may occur due to turtles resting/rubbing the bottom) encountered. Across the sides and tops of these spurs was a well-developed coral community with local coral coverage up to 40% present (Figure 3). Macroalgae are also present especially *Amansia glomerata* which is often seen along the edges of undercuts and caves. *Amansia glomerata* is a preferred species consumed by green turtles (Balazs *et al.* 1987).

Green turtles forage on a variety of algal species. On the shallow reef flat fronting the Kewalo Basin peninsula numerous red, green and brown algae are present. These algal communities are also seen on the adjacent reef flat fronting Ala Moana Beach Park on the east as well as fronting the deeper subtidal bench offshore of Kaka'ako Waterfront Park on the west. In short, there appears to be more than adequate appropriate algal forage for green turtles throughout the near shore waters.

Also on 30 March 2010 a small pod (estimated 15 individuals) of spinner porpoises (*Stenella longirostris*) were seen more than a kilometer from shore moving towards Waikiki (to the east). Spinner porpoises rest in sheltered bays along the coast by day and move offshore at dusk to feed on the fishes, squids and other species found in the deep scattering layer (DSL) offshore. By day, members of the DSL are found well offshore at depths from 300 to more than 900 m, and rise to the surface waters above at night which is the time that the spinner porpoises feed on members of this mesopelagic community. The small pod of spinner porpoises seen here may be part of a much larger group that the author has seen over the last 30 years from Barbers Point on the west to Koko Head on the east.

The endangered Hawaiian monk seal (*Monachus schauinslandi*) has been seen along O'ahu's south shore and sightings are becoming more commonplace around the populated Hawaiian Islands. No monk seals were observed during the field work but with their increased south shore presence, it is conceivable that a seal could pass through and utilize resources in the Kewalo Basin entrance channel during proposed construction or following it.

D. Fishery Resources of Kewalo Basin

This study did not find any fish or invertebrate species of commercial or recreational interest nor any species having a state-protected status either in Kewalo Basin or in the inner entrance channel area (Figure 1). Protected invertebrate species that are sometimes encountered in harbor settings include the black-lipped pearl oyster or pa (*Pinctada margaritifera*), the introduced oysters (*Crassostrea* spp.) as well as corals. Fish species of commercial and/or recreational interest that are frequently encountered in harbors include the Hawaiian silverside or ‘iao (*Atherinomorus insularum*), juvenile jacks or papio (family Carangidae), barracuda or kaku (*Spyraena barracuda*), mullets or ama-ama (*Mugil cephalus*), flagtails or aholehole (*Kuhlia sandvicensis*), goatfishes (family Mullidae), squirrelfishes or menpachi and ala‘ihi (family Holocentridae), surgeonfishes (family Acanthuridae), bigeyes or aweoweo (family Priacanthidae) and to a lesser extent a number of other fish species. However, among the most interesting fishes of commercial or recreational importance entering harbors are those that do so on a seasonal basis; these fishes are generally juveniles that shelter in harbors and bays around the Hawaiian Islands. Included in this group are juvenile bigeye scad or halalu (*Selar crumenophthalmus*) and juvenile goatfishes or ‘oama (*Mulloidichthys flavolineatus* and *M. vanicolensis*). Halalu are found in harbors and bays from July through December and ‘oama are seen in the spring months (March through May). None of these species were encountered during this survey in Kewalo Basin or inner entrance channel areas.

State law forbids and/or regulates fishing in many harbors but in years past fishing in harbors was pursued by many especially when halalu or akule (adult) (*Selar crumenophthalmus*) would "run" in Hawai‘i's harbors (see Hosaka 1944, page 135). These fish would occasionally enter Kewalo Basin in the 1950's and 1960's prompting many to fish from the wharves and piers (personal observations). Akule were not encountered in Kewalo Basin during this survey, although a school of unknown size in the seaward part of the entrance channel on 23 February 2010 (about 300 m seaward of the inner harbor). These were adult fish (akule) and not the juveniles (halalu) which usually enter harbors. To the author's knowledge, if akule were to enter the inner channel or harbor, officials would quickly disperse any fishermen wishing to fish there.

The Hawai‘i Community Development Authority (HCDA) has an agreement with the Kewalo Keiki Fishing Conservancy (KKFC) for use of the "Cove" at Kewalo Basin located along the southwestern (ewa makai) side of the harbor (Figure 1). The KKFC is a non-profit organization that uses the Cove and adjacent lands seaward of Honolulu Marine Inc.'s facilities to teach fishing skills, conservation principles, and Hawaiian cultural traditions for the preservation of ocean resources. The Cove receives little vessel use thus fishing there does not conflict with normal operations. As part of their program, the KKFC runs a "tag and release" program for papio (family Carangidae) and hosts school groups wanting to fish. However, our underwater observations made in the Cove on 23 February 2010 only noted a few individual fishes of three small species: the toby - *Canthigaster jactator*, the cardinalfish or ʻupapalu (*Foa brachygramma*) and the spotted boxfish or moa (*Ostracion meleagris*) none of which are of commercial or recreational interest.

Despite this 2010 study not finding any fish species of commercial or recreational interest within Kewalo Basin, it is possible that such species may, on occasion, enter the harbor. Current conditions indicate that Kewalo Basin is less than desirable as an appropriate habitat for many Hawaiian fish species today than in times past. These changes are related to the increasing levels of pollution and habitat degradation in the harbor today relative to past decades. Some indirect indication of the changes are noted below.

Ala Moana Park just southeast of Kewalo Basin has a series of three ponds with an interconnected channel running between them. These ponds are connected to the southeastern corner of Kewalo Basin via a channel that runs beneath the easternmost parking lot. In the 1950's at the change of tide hundreds of striped mullet or amaʻama (*Mugil cephalus*) and sharpnose mullet or uouoa (*Neomyxus leuciscus*) would enter the Ala Moana ponds on a rising tide and leave on the falling tide via this channel. These movements were related to lunar phases and the fishes involved were adults. Their presence and passage through this channel would attract fishermen young and old (personal observations). Today the Ala Moana ponds and channels are populated by the black-chin tilapia (*Sarotherodon melanotheron*) and the various species of tabai (sailfin molly - *Poecilia latipinna*, liberty molly - *Poecilia* sp. hybrid complex *salvatoris/mexicana* group and the cuban molly - *Limia vittata*). The native fish species of commercial and recreational interest apparently have largely disappeared from these waterways suggesting that they are probably also absent from the adjoining Kewalo Basin Harbor.

Fish species commonly caught by hook and line in Kewalo Basin during the 1950's and 1960's included mullet or amaʻama (*Mugil cephalus*), uouoa (*Neomyxus leuciscus*), menpachi (*Myripristes* spp.), aweoweo (*Heteropriacanthus cruentatus*), papio (family Carangidae), aholehole (*Kuhlia sandvicensis*), needlefish or ʻaha (*Platybelone argalus*), halalu or akule (*Selar crumenophthalmus*), goatfishes including weke (*Mulloidichthys flavolineatus*), wekeʻula (*M. vanicolensus*) and juveniles (ʻoama), moano (*Parupeneus multifasciatus*), weke pueo (*Upeneus arge*), mamo (*Abudefduf abdominalis*), kaku (*Sphyraena barracuda*), pakiʻi (*Bothus mancus*), moray eels or puhi (family Muraenidae) and puffers (family Tetraodontidae; personal observations). If current regulations permitted hook and line fishing in Kewalo Basin (other than at the Cove), catches of these species would undoubtedly be rare. As noted previously, the present survey of the harbor found no fish, shellfish or crustacean species of commercial or recreational importance within Kewalo Basin or inner entrance channel area.

3. Analysis of Impacts

Kewalo Basin was created by digging and dredging from the sea into old raised coral reef formations on land commencing in the late-1920's. By the mid-1950's most of the construction (bulkheads, etc.) had been completed. Storm drains discharge into the harbor and the elevation of the surrounding lands was raised using dredge spoils. To the west of Kewalo Basin is the Kaka‘ako Waterfront Park constructed on an old dump site and to the east is Ala Moana Park which was created using dredge spoils to cover an older shoreline dump site. Kewalo Basin was built for commercial use and commercial enterprise in the harbor continues to the present. Thus Kewalo Basin has received non-point source pollution from many sources since its construction.

With the many years of pollution and increasing numbers of non-native species successfully colonizing the harbor, much of the aquatic biota today is comprised of species with cosmopolitan distributions (i.e., widely distributed and common in many habitats), and include many species that are found in harbors in both tropical and temperate seas. These species have become the visually-apparent dominant marine benthos in Kewalo Basin inner harbor/entrance channel, and is found on hard substratum (pier pilings, bulkheads as well as on refuse on the bottom). The substratum of the inner harbor bottom is a mix of mud, silt, muddy sand and refuse. Small burrowing invertebrate species are present in this soft bottom as noted by their holes. Very few fishes are seen in the inner harbor and other than the tilapia, most of these are found in proximity to the harbor’s entrance channel. Thus the inner harbor is biologically degraded and few native species are present.

A major portion of the benthic species encountered in the biological inventory of Kewalo Basin inner harbor (from 38% to 58% per station, mean = 41%) are classed as alien species. These alien species are the visually dominant forms present and where native benthic species are encountered, they are often not readily apparent nor are their numbers and/or areal coverage high. Furthermore, many of the aquatic native species seen are species known to be hardy and capable of living in suboptimal habitats.

The degraded conditions and marine communities common to the inner harbor continue in a seaward direction into the entrance channel. Using the proposed project area boundary across the entrance channel of Kewalo Basin, the first sighting of corals occurs 150 m seaward along the eastern channel wall and on the western side of the channel, it is about 100 m seaward. At a distance of 200 m seaward, more native species become apparent such that by 250 m seaward, the usual complement of Hawaiian coral reef species are dominant. The inner portion of the entrance channel seaward of the proposed project area is dominated largely by alien species, and serves as a substantial “buffer zone” between the inner harbor and the seaward communities.

There are a number of potential impacts that could occur to the marine communities if the proposed redevelopment of Kewalo Basin is to proceed. These potential impacts fall into three categories: (1) impacts that may occur during the construction process; (2) impacts that may occur with the subsequent operation of the harbor; and (3) the cumulative impacts that may occur over time. These potential impacts are addressed for each of the major spatially separated communities or groups identified in this inventory: (1) the highly-disturbed, alien-dominated communities of the inner harbor and shoreward portion of the entrance channel; (2) the marine communities found in the outer portion of the entrance channel and seaward of it; and (3) protected species within and seaward of the entrance channel. These are discussed below.

A. Potential Impacts to Marine Communities of the Inner Harbor and Shoreward Portion of the Entrance Channel

1. Construction Activities

The construction process includes repairs to the existing docks, demolition of existing fixed piers, addition of new piers which may be either fixed or floating construction or both, as well as new utilities throughout the harbor. Repairs to existing docks as well as the development of new utilities will probably have little impact on the harbor's aquatic biota because these activities are occurring out of the water. However, the demolition and removal of existing fixed piers causes the removal of the sessile biota on the submerged portions of those piers. In all probability the larger refuse that has collected under and adjacent to those piers would also be removed at the same time which means any biota on those materials would also be removed. Since the affected benthic communities are dominated by alien species with broad geographic distributions, the loss is trivial from the perspective of native marine communities. Furthermore, the redevelopment of the harbor is expected to increase the number of slips by about 75% and increase the total linear moorage capacity by about 45% which means that more hard substratum would undoubtedly be available for subsequent recruitment by benthic species than is present now. Based on current available design information, floating piers would result in approximately 250-300 piles and fixed piers would result in about 500-550 piles, in comparison to the 400 piles currently in place. With floating piers, the bottom of the piers will always be in contact with the water since their weight is supported by the water versus the fixed piers currently in place which are above the water line. It is expected that the same suite of sessile species presently in the harbor would be those recruiting to the new subtidal hard substratum. Thus in the end, there would be more area for hard bottom benthos to colonize than is present today in the harbor.

Part of the redevelopment would include pre-drilling and pile-driving. These activities would serve to disturb the sediment in the vicinity of the activities. Since this sediment contains pollutants (metals, oils and grease), disturbance could release previously sequestered pollutants back into the water column. However, the marine communities present in the harbor now undoubtedly have continuing exposure to many of the same pollutants following heavy rainfall and runoff which enters the harbor. Additionally, when larger vessels enter or exit the harbor, the thrust of the prop wash serves to stir the fine muddy substratum up into the water column. This action potentially releases sequestered materials back into the water column as well as exposes benthic species to high turbidity thus the species present tolerate these conditions.

Among the pollutant present include petroleum products and a number of metals (arsenic, chromium, copper, lead, nickel, zinc as well as mercury; Marine Research Consultants 2010). Given that the residence time of water in the harbor is long, the pollutant and sediment load traveling to more offshore areas (i.e., the outer entrance channel and beyond) is expected to be low.

Pre-drilling and pile driving creates noise both in air and under water. The benthic species found in the inner harbor area are comprised of lower phyletic forms that have no ability to detect sound. However, fishes do "hear" and detect sound waves but their mobility allows them to just move away from the source of the sounds reducing the probability of impact to these species. As noted above, the most common fish species this study encountered in Kewalo Basin was the alien black-chin tilapia (*Sarotherodon melanotheron*). Since the ubiquitous black-chin tilapia is found around the pier pilings and under wharves, it will probably be affected by pile driving and other construction activities.

2. Harbor Operations Following Construction and Cumulative Impacts

Assuming that the redevelopment of Kewalo Basin includes the 75% increase in slips and a 45% increase in total linear moorage, there will be a greater number of vessels and ship traffic in the harbor. This increased ship traffic may have additional potential impacts to the species resident to the inner harbor and inner entrance channel areas. Possible impacts to the resident biota from harbor operations are related to (1) greater exposure to sediment stirred up by large ship prop-wash and (2) possible further successful alien species introductions. Since this study did not find any threatened or endangered species either in Kewalo Basin or in the inner entrance channel areas, impacts to these species are discussed in Section 3.C below.

If the increased vessel traffic includes a greater number of larger vessels whose prop-wash will increase the stirring up of the mud substratum into the water column, resident benthic biota will be subject to greater exposure to sediments and possibly sequestered pollutants. The alien-dominated resident benthic biota of Kewalo Basin presently receives such exposure but at some point, greater exposure will result in impact to these communities, leaving only the most tolerant species to survive in the affected area(s).

Increased vessel traffic increases the potential for further alien species introductions to Kewalo Basin. If these introductions successfully establish, they will compete for resources with species presently in the harbor. Kewalo Basin primarily serves local commercial vessel traffic which is confined to local waters. Vessels moving in and out of the harbor could serve as vectors for transport and successful recruitment of alien species not already present in Kewalo Basin, For the most part, the new recruits would be from local sources already established elsewhere in Hawaiian waters.

For vessels coming from elsewhere there are regulations regarding unintentional importation of aquatic alien species. The discharge of ship's ballast water is a well-known source for the accidental introduction of aquatic alien species (Ruiz, *et al.* 1997). The National Invasive Species Act of 1996 provides federal guidelines for the discharge of ship's ballast water and the Department of Land and Natural Resources Administrative Rules (HAR§13-76-11 through §13-76-20, October 2007) mirror those guidelines. In addition, the State of Hawai'i produced an aquatic invasive species plan (DLNR 2003) designed to reduce the successful establishment of unwanted aquatic species. These federal and state regulations include Best Management Practices (BMP's) for vessels arriving from outside of the state, decreasing the opportunity for aquatic alien species introductions. These regulations apply to vessels arriving in all Hawaiian harbors.

In summary, the proposed redevelopment of Kewalo Basin should have little negative consequence to native marine species because the affected benthic communities are dominated by alien species that have broad geographic distributions. The proposed activities are occurring in a degraded marine environment with poor biological resources. Following completion of construction activities, any displaced species will undoubtedly re-establish themselves. Thus over the long term, the suite of alien species that dominate the benthos of the harbor will continue to do so.

B. Potential Impacts to Marine Communities of the Outer Portion of the Entrance Channel and Seaward Areas

1. Construction Activities

Under existing conditions and following heavy rainfall/runoff, all of the marine communities offshore of Kewalo Basin are exposed to high turbidity and lower salinities from the runoff coming from all discharge points along the Waikiki-downtown Honolulu coastline. Marine communities in closer proximity to shore, shallow water and the discharge sources (i.e., storm drains, etc.) following heavy rain have a greater chance of suffering impacts from high turbidity and freshwater exposure, while more offshore, deeper water communities probably receive little impact from these events. In short, the marine communities and in particular, the sessile (non-mobile) biota present in both the shallow as well as the more offshore areas are those that have evolved to survive these occasional negative conditions.

Judging from observations in Kewalo Basin, the residence time of water in the harbor is long and turbidity generated by ship activities and other present sources does not normally reach the harbor entrance channel. However, high rainfall and runoff events likely carry materials out through the entrance channel. Again, the sessile biota present at any given site in or outside of the harbor has survived the environmental conditions it has been exposed to over its lifetime. Thus, demolition and removal of pier pilings, as well as the pre-drilling and driving of piles for new piers in the harbor, would probably not generate sufficient turbidity to reach the outer reaches of the Kewalo Basin entrance channel under normal conditions. It is expected that neither turbidity nor release of pollutants from disturbance to the harbor sediments during construction would be much different than occurs today with ship activities (i.e., prop-wash), or rain and runoff events. Thus the marine communities of the harbor entrance channel and those seaward of it would probably not receive impact at levels any different than occurs today. Again over the long term, these communities are expected to persist.

Best Management Practices such as silt curtains could be deployed during in-water construction activities to contain resuspended sediments, reducing the opportunity for impact to occur to the marine communities in the outer harbor entrance channel and seaward of it. This mitigative measure will address the above concerns but would not address the concern over noise created by the demolition and construction of new piers which includes pre-drilling and pile-driving. Noise will potentially affect fishes (discussed previously) as well as protected species (discussed below).

2. Harbor Operations Following Construction/Cumulative Impacts

Following completion of harbor improvements, vessel traffic will not only increase but a greater number of larger vessels may use Kewalo Basin. Increased use increases the possibility of ship groundings, collisions, spills and physical resuspension of harbor sediments by prop-wash. However, marine communities in the outer portion of the Kewalo Basin entrance channel and environs would have little chance of impact from activities occurring in the inner harbor (such as exposure to resuspended sediments due to prop wash as they are not exposed to today), but if collisions occur in the outer entrance channel or groundings occur on reef areas adjacent to the channel, impacts to marine communities in the outer portion of the entrance channel and environs could occur.

Accidental ship groundings physically damage benthic communities which they come into contact with. Groundings as well as collisions enhance the probability of accidental spills of pollutants. Modern technology such as global positioning systems improve navigation, and reduce the opportunities for such accidents to occur. Furthermore, proper licensing of vessel captain and adherence to the “rules of the road” reduces risks of collisions and/or groundings occurring.

Over the long term, the marine communities present in the outer portion of the Kewalo Basin entrance channel and environs will be those communities that have persisted under the suite of natural and anthropogenic-induced environmental conditions present in that area. The proposed construction and subsequent operation of Kewalo Basin is not expected to increase the scale of potentially negative environmental conditions over those that are present now. Thus species composition and abundance of the biota in the areas seaward of the harbor are expected to remain unchanged in the future.

C. Potential Impacts to Protected Species Within and Seaward of the Kewalo Basin Entrance Channel

1. Construction Activities

Although no protected species were seen in Kewalo Basin or the inner entrance channel area in this study, one green sea turtle was seen in the outer portion of the entrance channel in the February 2010 survey. Since protected species may, at times, enter Kewalo Basin, potential impacts to these species must be examined.

Based on the configuration of Kewalo Basin and location of the proposed demolition and construction, much of the noise generated by these activities will be contained within the harbor. Much of Kewalo Basin is fronted by a dredge material-filled peninsula fronted by a boulder riprap as well as bulkheads along much of the shoreward side which serves to shield most of the seaward exposure of the harbor from noise being propagated in a seaward direction. The entrance channel, which represents less than 4% of the harbor's enclosed circumference, is the conduit of sound propagating in a seaward direction. Sound energy propagated within the harbor must pass through the long and narrow entrance channel and shallow bordering reef with turbulent, aerated water. In doing so, this energy is partially absorbed and scattered thus attenuation occurs in a seaward direction from the channel entrance.

With proposed improvements, it is estimated that the floating piers will require 250-300 piles and the fixed piers will utilize between 500-550 piles. Goody (2010) ion his analysis of calculated sound energy levels generated by pile driving in Kewalo Basin, assumed that 10% will be 20-inch concrete piles and driving the 20-inch piles creates the highest sound energy values. The analysis of underwater noise from pile driving activities (Goody 2010) utilized National Marine Fisheries Service (NMFS) methodology for calculating spreading loss. The impact of propagated noise is compared to published values for harassment of protected or listed species as well as to bare-headed human SCUBA divers. The protected species of concern are humpback whales and spinner porpoise (Cetacea), Hawaiian monk seals (Pinnipedia) and green sea turtles (*Chelonia*), for which NMFS harassment levels are 160 dB.

The closest pile driving would be located 150 m from the harbor entrance channel and the most distant, 520 m. Using calculated sound energy levels generated by driving a 20-inch concrete pile, the area equaling or exceeding the protected species criteria has a radius of 54 m of the pile being driven. The harassment radius for the smaller 16-inch and 12-inch piles is 34 m and 9 m respectively. Thus the area of harassment would be contained entirely within the harbor for all pilings. The radius within which recreational SCUBA diving advisory levels are exceeded is 136 m for the 20-inch piles which is also completely within the harbor (Goody 2010) where public diving is not allowed.

To further reduce the impact of noise, procedural mitigation efforts suggested by Goody

(2010) could include working only during daylight hours and observing for the presence of protected species within the affected zones before starting work (or prior to re-starting after a 30-minute hiatus), and ramping up pile driving energies slowly to allow any animals within the zone to depart before criteria levels of sound energy are produced.

Since the protected species harassment levels of calculated sound energies produced by pile driving will be contained entirely within Kewalo Basin and no protected species were sighted within the affected zone, there is low probability of negative impact occurring to these species by construction activities. The primary protected species that could potentially be impacted by the proposed construction and subsequent operation of the harbor is the green sea turtle simply because of its greater permanent population present in the waters seaward of the entrance channel. Past observations on the response of green sea turtles to underwater construction, dredging and resulting turbidity provide some insight as to how this species responded to these activities at another Oʻahu location. Citing from the executive summary (Brock 1990),

"From April 1987 through July 1990 we examined the stability of the green turtle population in the nearshore waters fronting a 2.1 km section of coastline at West Beach, Oahu...This study has been undertaken to address the question 'Have the shoreline construction activities at West Beach had any discernable impact on the resident green turtle population?'"

By way of background, the construction activities developed four large swimming lagoons that are connected to the adjacent ocean. These lagoons were initially dug "in the dry" shoreward of a beachrock bench that fronts this entire West Beach coastline. The construction included the use of dynamite, bulldozers and large cranes. Dredging was necessary to connect the lagoons with the ocean and resulted in considerable transitory turbidity. The noise levels in the ocean were readily discernible to divers up to one kilometer seaward observing green turtles in their resident habitat. Because of the heightened concern over the welfare and status of the resident turtles, a representative from the National Marine Fisheries Service Honolulu Laboratory (Mr. John Naughton) was present during the field surveys.

"Underwater surveys were conducted to census the green turtles in their resting habitat offshore of West Beach. Our data show that in the time between preconstruction surveys (June 1987) and the commencement of shoreline construction (June 1988), green turtle numbers decreased. Once construction started remaining individuals appeared to abandon an offshore diurnally used resting site which is more than 1 km from shore in favor of a resting area about 250 m offshore of the construction area. A 90-day construction moratorium appeared to have little impact on resident turtles; during this time many turtles dispersed along the coast, having a diurnal distribution along the entire project site within about 400 m of the shore. This distribution changed little during the subsequent 13-month period of construction of three additional lagoons. As an unbiased measure of abundance, the time necessary for an observer to sight a turtle increased but did not statistically change through the period of this study.

There has been a decrease in the mean size of turtles sighted in the project area since the *commencement of construction. Using visual estimates of size, prior to construction, 49 percent of the turtles were adults; seven months following the termination of construction, it is estimated that 11 percent of the turtles sighted were adults. These changes in the size of turtles encountered at West Beach may be related to migration of the adults to the Northwest Hawaiian Islands for reproductive purposes.*

The construction activities do not adequately explain the changes in the apparent abundance of green turtles. Despite the changes to the shoreline, subtidal algal species appropriate as turtle forage increased in abundance adjacent to the construction sites. The movement of turtles to a new resting site within 250 m of the actual 'in water' construction activities and the appearance of juveniles in these same waters where they had not been seen previously suggest that the observed changes may not be construction related.

In short, we know little of the small-scale and short term movement patterns or resting habitat requirements of Hawaiian green turtles. Furthermore, we are unaware if long term cycles of local abundance do occur; lacking this knowledge hampers the interpretation of data. Until we have a better understanding of the population structure and local movement patterns of green turtles over a much broader area than the West Beach site, any conclusion as to the impact of lagoon construction on green turtles is difficult to unequivocally ascertain."

The primary point to be gleaned from the West Beach study (Brock 1990) is that the turtles were apparently unaffected by the construction noise at West Beach and in fact moved from a resting site located more than a kilometer offshore to a new resting area within 250 m of the ongoing construction activities. This suggests that the ambient construction noise and resulting high turbidity were unimportant to these turtles. If this is correct, noise generated by pre-drilling and pile driving in Kewalo Basin will probably have little negative impact on the green turtles utilizing resting sites and forage areas in the entrance channel and environs.

2. Harbor Operations Following Construction/Cumulative Impacts

Expansion of the Kewalo Basin facility will increase the number of slips by about 75% (to 250) and there will be a 13,100-foot increase in lineal moorage (a 45% increase) which will increase the number of vessels using the harbor as well as increasing vessel traffic. As noted above, the primary protected species that could potentially be impacted by harbor operations is the green sea turtle due to its greater permanent population present in the waters seaward of the harbor entrance channel. Greater vessel traffic increases the probability of collision with green turtles surfacing for air as well as subjecting them to high noise levels due to passing ships. Accidental ship groundings or ship collisions increase the possibility of accidental spills of pollutants which could impact T & E species in adjacent waters. However, global positioning systems improve navigation, and reduce the opportunities for accidents and related pollutant spills to occur. Adherence to the "rules of the road" which includes speed restrictions in harbor waters reduces the risk of collisions with green turtles. However, existing literature suggests that increasing vessel use of a harbor does not necessarily have a negative impact on resident green sea turtles.

Since the early 1900's Pearl Harbor has been one of the U.S. Navy's largest and most important harbors in the Pacific, and receives considerable vessel traffic. A study of fish and benthic communities in Pearl Harbor and the entrance channel noted a total of 58 green turtles residing in the entrance channel (Smith *et al.* 2006). Many of these turtles were adults with most of them being seen in two resting sites located along the edges of the entrance channel. Much of the vessel traffic in Pearl Harbor is comprised of large vessels (including nuclear submarines and aircraft carriers) thus some of this traffic generates considerable noise in passing through the channel. The Navy's use of Pearl Harbor and the entrance channel apparently has no negative impact on the presence of green turtles because Smith (1999) found from 32 to 41 green turtles residing in the entrance channel over a three-month period of study. Thus the increasing numbers of turtles utilizing the resting and forage habitats in the entrance channel over the seven-year period between these two studies suggests that vessel traffic is of little or no consequence to the resident green turtle population.

While the studies conducted by Brock (1990) and Smith *et al.* (2006) are not conclusive, the data suggest that many ship activities occurring in and adjacent to harbors appears to have no definable impact on the green turtles residing in the entrance channels of these harbors. It is concluded that the proposed redevelopment activities and subsequent operation of Kewalo Basin should not create a negative impact to the green turtles residing in the vicinity of the entrance channel and environs.

4. Synopsis of Kewalo Basin as Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA) requires an assessment of how the proposed changes to Kewalo Basin may affect the harbor serving as Essential Fish Habitat (EFH). The 1996 amendments to the MSFCMA set forth a mandate for NOAA Fisheries, regional Fishery Management Councils (FMC), and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats must be maintained. EFH is separated into estuarine and marine components. The marine component is defined as "all marine waters and substrates (mud, sand, shell, rock, hard bottom and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone". In the case of the proposed Kewalo Basin redevelopment, the adjacent EFH waters are marine but within a biologically-degraded harbor. Thus potentially affected species could possibly include coral reef species. The MSFCMA was designed to protect and conserve important fish/fisheries habitats, including coral reef fisheries. Because these fisheries are totally dependent upon the coral reef ecosystem in which they occur, an ecosystem approach to this protection and conservation has been taken for determination of EFH effects on coral reefs. The coral reef fisheries provide sustenance and have economic value to island economies but probably of greater importance is the fact that these fisheries have long traditional roots to the past for many people in Hawai'i and thus are central to local culture.

Kewalo Basin was built for commercial use and commercial enterprise continues to present. Storm drains empty into Kewalo Basin and adjacent lands (both to the east and west of it) were former shoreline/shallow water dump sites thus the harbor has received non-point source pollution from many sources since its construction. In the past, fish species of recreational and commercial interest were a common occurrence in Kewalo Basin as documented above. However with the many years of pollution and increasing numbers of non-native species successfully colonizing Kewalo Basin, much of the aquatic biota today is comprised of species with cosmopolitan distributions and are found in many harbors in both tropical and temperate seas. These species have become the visually-apparent dominant marine benthos in Kewalo Basin and the inner entrance channel areas, and this fouling community occurs on hard substratum (pier pilings, bulkheads as well as refuse on the bottom). The substratum is a mix of mud, silt, muddy sand and refuse. Burrowing species are present in this soft bottom as noted by their holes. Very few fishes are seen in the inner harbor and other than the alien black-chin tilapia, most of these are found in proximity to the harbor's entrance channel. Thus the harbor is biologically degraded and few native species are present.

The degraded conditions and marine communities common to the inner harbor continue in a seaward direction into the entrance channel. The first coral colonies to be seen are located 150 m seaward along the eastern entrance channel wall and 100 m seaward along the western channel wall. It is not until one is 200 m seaward that more native species become apparent such that by 250 m seaward, the usual complement of Hawaiian coral reef species are dominant. Thus there is a substantial "buffer zone" between the inner harbor dominated by alien species where redevelopment will take place and the native coral reef communities which are located well seaward. The present survey of the harbor found no fish, shellfish or crustacean species commercial or recreational importance within the inner harbor.

The biologically-degraded, alien-dominated communities in the harbor are those that can successfully compete for resources; few native species are present and when seen are in relatively low abundance/coverage with many of them being found in proximity to the harbor's entrance channel. These findings support the contention that the physical and chemical conditions in Kewalo Basin are not favorable for many coral reef species today, thus their recruitment to the harbor is greatly diminished. The environmental conditions in Kewalo Basin have not been favorable for native Hawaiian coral reef species for a long time; Coles *et al.* (1999b) found the benthic communities to be highly disturbed with many alien species present and the present study twelve years later has found the dominance of alien species to have increased.

The goal of EFH is to protect economically important marine and estuarine fisheries and to achieve this goal, suitable fishery habitats which protect all life stages of all species of concern must be maintained. Because Hawaiʻi's inshore fisheries are totally dependent upon the coral reef ecosystem in which they occur, an ecosystem approach to this protection and conservation has been taken by the Western Pacific Regional Fisheries Management Council for determination of EFH effects on coral reefs. Presently there is little recruitment of any native coral reef species into Kewalo Basin because both the chemical and biological conditions are not suitable for most native coral reef species. Given this, it could be argued that the harbor should not be considered further in terms of EFH for Hawaiian coral reef species. Furthermore, since there is a substantial buffer zone in the Kewalo Basin entrance channel between the area considered for proposed improvements and the normal coral reef environment dominated by native species located more than 200 m seaward, concern that the proposed construction will impact EFH is not warranted.

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TABLE 1. List of species seen at the four stations sampled in Kewalo Basin on 23 February 2010. Some identifications were made in the field while others required collection of samples for later identification in the laboratory. Note that emphasis was placed on larger species present which are dominant members of the fouling community. All fishes seen were noted; some species (primarily fishes) were seen only by a visual inspection of the harbor from land carried out on 26 February 2010. Species that are considered to be nonindigenous (alien or introduced) are shown with an "I" designation and those that are considered to be cryptogenic are shown with a "C" otherwise if blank, they are considered to be native species.

Phylum and Species	Native or Alien	Station Number 1	2	3	4
Algae					
Phylum Chlorophyta (green algae)					
Ulva fasciata		X			X
Cladophora vagabunda			X	X	X
Chaetomorpha antennina		X	X		
Bryopsis pennata					X
Phylum Rhodophyta (red algae)					
Centroceras clavulatum				X	X
Peyssonelia inamoena (?)					X
Rhodymenia leptophylla			X	X	X
Mastophora pacifica					X
Acanthophora spicifera	I	X		X	X
Animals					
Phylum Porifera (sponges)					
Halichondria dura			X		X
Halichondria coerulea	C	X		X	X
Mycale cecilia	I			X	
Zygomycale parishii	I				X
Gelliodes fibrosa	I			X	
Mycale armata	C			X	
Phylum Cnidaria (anemones, corals)					
Pennaria disticha	I	X	X	X	X
Carijoa riisei	I				X
Pylum Annelida (worms)					
Sabellastarte sanctijosephi	C	X	X	X	X
Salmacina dysteri	I			X	X
Thelepus setosus					X
Branchiomma nigromaculata	C	X	X	X	X

TABLE 1. Continued.

Phylum and Species	Native or Alien	Station Number 1	2	3	4
Phylum Mollusca					
Littorina pintada					X
Vermetus alii	I	X		X	X
Siphonaria normalis			X	X	X
Isognomon californicum			X		X
Dendrostrea sandvichensis		X	X	X	X
Balanus amphitrite	I	X	X	X	X
Chthalmalus proteus	I				X
Phylum Arthropoda (shrimps, crabs)					
Stenopus hispidus				X	X
Alpheus mackayi		X	X		X
Thalamita edwardsi					X
Thalamita integra		X	X	X	X
Metapograpsus thunkuhar		X		X	X
Phylum Ectoprocta (bryozoans)					
Zoobotryon verticillatum	I	X	X	X	
Bugula neritima	I	X		X	X
Schizoporella unicornis	I	X	X	X	X
Amathia distans	I		X	X	X
Hippopodina feegeensis(?)	I	X	X	X	X
Phylum Chordata (tunicates)					
Didemnum candidum	I				X
Ascidia syndneiensis	I	X			X
Phallusia nigra	I	X	X	X	X
Herdmania momus	I	X	X	X	X
Phylum Chordata (fishes)					
Aulostomus chinensis		X	X	X	X
Kuhlia sandvicensis (1 juvenile)					X
Apogon kallopterus					X
Foa brachygramma		X			X
Chaetoton lunula					X
Thalassoma duperrey					X
Sarotherodon melanotheron	I	X	X	X	X
Abdufduf abdominalis			X	X	X
Zanclus cornutus				X	X
Acanthurus blochii					X
Acanthurus nigrofuscus				X	X

TABLE 1. Continued.

Phylum and Species	Native or Alien	Station Number 1	2	3	4
Phylum Chordata (**Continued**)					
Acanthurus xanthopterus					X
Ostracion meleagris		X			X
Saurida flamma			X		
Psilogobius mainlandi		X			
Sphyraena barracuda (1 juvenile)		X			
Total Number of All Species	**58**				
Total Number of Species/Station		**26**	**23**	**31**	**50**
Total Number of Native Species/Station		**12**	**13**	**13**	**31**
Percent Native Species/Station		**46**	**57**	**42**	**62**
Total Number Non-Native Species/Station		**14**	**10**	**18**	**19**
Percent Non-Native Species/Station		**54**	**43**	**58**	**38**

TABLE 2. List of fish and coral species seen in the entrance channel of Kewalo Basin on 23 February 2010 during a single census along the east and west sides of the entrance channel. The data below are given in 100 m long segments to a point seaward where the usual array of Hawaiian coral reef species are encountered demonstrating the large change in species composition with distance from the inner harbor. Non-native species are so indicated.

1. Eastern Channel Wall commencing at the western edge of the Makai Wharf and continuing to Buoy 6 (100 m seaward) along the boulder riprap:

Corals: None
Fishes: black-chin tilapia (*Sarotherodon melanotheron*) - Introduced
moorish idol or kihikihi (*Zanclus cornutus*)
stripebelly puffer or o'opu hue (*Arothron hispidus*)

2. Eastern Channel Wall commencing at Buoy 6 to a point 100 m seaward along the boulder riprap:

Corals: *Pocillopora damicornis* (single 4 cm diameter colony seen at ~50 m)
Fishes: blackspot sergeant or kupipi (*Abudefduf sordidus*)
Pacific gregory (*Stegastes fasciolatus*)
raccoon butterfly fish or kikakapu (*Chaetodon lunula*)
bird wrasse or hinalea i'iwi (*Gomphosus varius*)
belted wrasse or 'omaka (*Stethojulis balteata*)
saddle wrasse or hinalea lauwili (*Thalassoma duperrey*)
halfspot goby (*Asterropteryx semipunctatus*)
moorish idol or kihikihi (*Zanclus cornutus*)
brown surgeonfish or ma'i'i'i (*Acanthurus nigrofuscus*)
convict tang or manini (*Acanthurus triostegus*)
slender lizardfish or 'ulae (*Saurida gracilis*)
boxfish or moa (*Ostracion meleagris*)
stripebelly puffer or o'opu hue (*Arothron hispidus*)
whitespotted toby (*Canthigaster jactator*)

3. Eastern Channel Wall last 40 m (most seaward portion) of boulder riprap:

Corals: *Pocillopora damicornis* (coverage <1%)
Pocillopora meandrina (coverage ~1%)
Porites lobata (coverage ~1%, largest colony seen ~ 45 cm diameter)
Fishes: blackspot sergeant or kupipi (*Abudefduf sordidus*)
Pacific gregory (*Stegastes fasciolatus*)
Hawaiian dascyllus or 'alo'ilo'i (*Dascyllus albisella*)
bigeye scad or akule (*Selar crumenophthalmus*) - large school of adult fish

TABLE 2. Continued:

Fishes (Continued)

raccoon butterfly fish or kikakapu (*Chaetodon lunula*)
blue goatfish or moano kea (*Parupeneus cyclostomus*)
manybar goatsih or moano (*Parupeneus multifasciatus)*
bird wrasse or hinalea i'iwi (*Gomphosus varius*)
belted wrasse or ʻomaka (*Stethojulis balteata*)
saddle wrasse or hinalea lauwili (*Thalassoma duperrey*)
halfspot goby (*Asterropteryx semipunctatus*)
moorish idol or kihikihi (*Zanclus cornutus*)
brown surgeonfish or ma'i'i'i (*Acanthurus nigrofuscus*)
convict tang or manini (*Acanthurus triostegus*)
ringtail surgeonfish or pualu (*Acanthurus blochii*)
yellowfin surgeonfish or pualu (*Acanthurus xanthopterus*)
palenose parrotfish or uhu (*Scarus psittacus*)
slender lizardfish or ʻulae (*Saurida gracilis*)
boxfish or moa (*Ostracion meleagris*)
stripebelly puffer or o'opu hue (*Arothron hispidus*)
whitespotted toby (*Canthigaster jactator*)

4. Eastern Channel Wall seaward of the boulder riprap to a point ~ 250 m seaward:

From the seaward end of the boulder riprap moving in an offshore direction, the coral and fish communities appear to be those normally seen in shallow reef habitats. Corals seen include *Porites lobata, Pavona duerdeni, Pavona varians, Monitpora verrucosa, Montipora patula, Pocillopora meandrina* and *Montipora verrilli*. Coral coverage increases in a seaward direction with estimates ranging from 2 to 15% over scales of several meters. Fish communities are reasonably diverse with many species of recreational and commercial interest present.

5. Western Channel Wall commencing at Buoy 3 and continuing shoreward to the Hololulu Marine Inc. Shipyard (old Hawaiian Tuna Packers Shipyard ~420 m inshore of Buoy 3):

Marine communities are well developed seaward of the boulder riprap along the western side of the Kewalo Basin entrance channel. Coral and fish communities are similar to those seen on the eastern side of the channel and these diverse communities continue along the riprap to a point fronting the University of Hawaiʻi Pacific Biomedical Research Center (Kewalo Laboratory) where at approximately 175 m inshore of Buoy 3 the diversity of the marine communities (fish and corals) diminishes. Roughly within the next 50-75 m shoreward (fronting the mauka boundary of the John Dominis Restaurant), corals are no longer seen and the diversity of fishes declines significantly to the conditions seen elsewhere in the inner harbor basin.

FIGURE 1. Aerial of Kewalo Basin Harbor, the entrance channel and the coral reef seaward of the harbor. Important landmarks are noted on the aerial. The double-headed arrow across the harbor mouth indicates the seaward boundary of the proposed project area. The seaward limit of the inner entrance channel where marine communities continue to be dominated by alien species is shown with a dashed line. The four sample sites in the harbor are numbered. Note that Station 4 covered an approximate 140 m distance along and under the old Fisherman's Wharf and this is shown with a solid line. Solid lines along both the east and west sides of the entrance channel show the approximate tracks of two scuba dives done examining marine communities in that area. Hatched area seaward of Kewalo Basin and to the west indicate the approximate area examined for green sea turtles. Approximate scale is 1 inch = 95 m.

Note: Green sea turtle survey areas and locations of report figures are approximate representations.

FIGURE 2. Photograph showing the typical edge of a limestone ridge or "spur" projecting seaward located about 475 m offshore of Kewalo Basin in 11 m of water, 30 March 2010. Also shown are corals (the rice coral - *Montipora patula*, lobate coral - *Porites lobata* and cauliflower coral - *Pocillopora meandrina*) on this ridge. Green turtles often diurnally rest on the bottom alongside of the coralline ridge and sand/rubble interface; however, no evidence of turtle resting was observed in this location.

FIGURE 3. Photograph showing the development of the coral community on the top of a limestone ridge or spur, depth 10 m, 500 m offshore of Kewalo Basin on 30 March 2010. Dominant coral species include the cauliflower coral (*Pocillopora meandrina*) and encrusting lobate coral (*Porites lobata*). Fish in the background water column include the sleek unicornfish or kala holo (*Naso hexacanthus*).

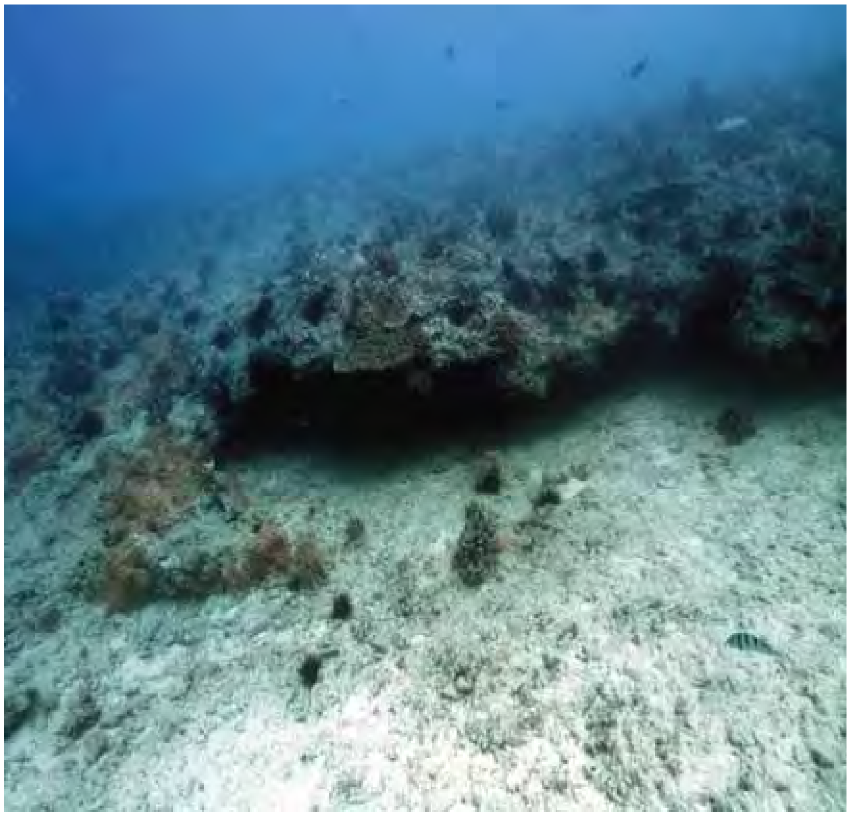

FIGURE 4. Photograph of the seaward end of a limestone spur or ridge showing a small undercut that could be used by Hawaiian green turtles for diurnal resting; however, no evidence of turtle resting was observed in this area (i.e., ‘worn’ or ‘smooth’ substratum). Depth is approximately 12 m and the location is about 500 m offshore of Kewalo Basin on 30 March 2010. Also shown in the photograph are corals (encrusting rice coral - *Montipora patula*, lobate coral - *Porites lobata* and a number of cauliflower coral colonies - *Pocillopora meandrina*). Sea urchins in the foreground are wana (*Echinothrix diadema*).

APPENDIX 1

ESSENTIAL FISH HABITAT ASSESSMENT FOR THE

PROPOSED REDEVELOPMENT OF KEWALO BASIN

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1. Introduction

This assessment presents the findings on the status of Kewalo Basin serving as Essential Fish Habitat (EFH) and has been prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA) as amended. The objectives of this EFH assessment are to describe how the actions proposed in the Kewalo Basin redevelopment project might affect EFH designated by the National Marine Fisheries Service and the Western Pacific Region Fisheries Management Council (WPRFMC) for the region of influence around the project site. EFH waters adjacent to the project are marine and thus potentially affected species could include all of those as identified in the Coral Reef, Bottomfish, Crustacean and Pelagic Fisheries Management Plans (FMPs). The technical descriptions used herein are from the marine biological inventory and impact analysis of Kewalo Basin (Brock 2010).

The 1996 amendments to the MSFCMA set forth a mandate for NOAA Fisheries, regional Fishery Management Councils (FMC), and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats must be maintained. EFH in the project's area of effect could possibly include some of the life history stages of some coral reef species but since the project area is within the confines of a harbor, it is doubtful that the harbor would serve as EFH for any of the specific fisheries that include Bottomfish, Crustaceans or Pelagic Fish. A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by a Fishery Management Plan (FMP). The mandate of the WPRFMC includes Hawaiʻi and other islands to the south and has developed FMP's for Coral Reefs, Bottomfish, Crustaceans, Precious Corals and Pelagic Species which covers the resources found in these areas.

EFH is separated into estuarine and marine components. The estuarine component is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the subtidal vegetation (grasses and algae) and adjacent intertidal vegetation (marshes and mangroves)." The marine component is defined as "all marine waters and substrates (mud, sand, shell, rock, hard bottom and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone." In the case of the proposed Kewalo Basin redevelopment, the adjacent EFH waters are marine but within a biologically-degraded harbor. Thus potentially affected species could possibly include coral reef species but probably none of the others covered under FMP's.

The MSFCMA was designed to protect and conserve important fish/fisheries habitats, including coral reef associated fisheries. Because these fisheries are totally dependent upon the coral reef ecosystem in which they occur, an ecosystem approach to this protection and conservation has been taken for determination of EFH effects on coral reefs. For coral reef fisheries, the WPFMC document defining EFH summarizes the life history information for 61 families of fishes, four major invertebrate groups (including reef-associated crustaceans) as well as the sessile benthos. The sessile benthos is comprised of a large group of species; in Hawaiʻi alone there are 450 algae, 50 Scleractinia and more than 150 other species (Eldredge and Miller 1995). The coral reef fisheries provide sustenance and have economic value to island economies but probably of greater importance is the fact that these fisheries have long traditional roots to the past for many people in Hawaiʻi and thus are central to local culture.

2. Existing Environment

The proposed redevelopment of Kewalo Basin is to occur within the confines of the existing harbor. This harbor has a water surface area of about 22 acres and was constructed over a thirty-year period ending in the mid-1950's. Storm drains discharge into the harbor and the elevation of the surrounding lands was raised using dredge spoils. To the west of Kewalo Basin is the Kakaʻako Waterfront Park constructed on an old dump site and to the east is Ala Moana Park which was created using dredge spoils to cover an older shoreline dump site. Kewalo Basin was built for commercial use and commercial enterprise in the harbor continues to the present. Thus Kewalo Basin has received non-point source pollution from many sources since its construction.

With the many years of pollution and increasing numbers of non-native species successfully colonizing the harbor, much of the aquatic biota today is comprised of species with cosmopolitan distributions thus many are found in harbors in both tropical and temperate seas. These species have become the visually-apparent dominant marine benthos in Kewalo Basin inner harbor/entrance channel and this fouling community is found on hard substratum (pier pilings, bulkheads as well as on refuse on the bottom). The substratum of the inner harbor bottom is a mix of mud, silt, muddy sand and refuse. Burrowing species are present in this soft bottom as noted by their holes. Very few fishes are seen in the inner harbor and other than the black-chin tilapia, most of these are found in proximity to the harbor's entrance channel. Thus the inner harbor is biologically degraded and few native species are present.

The degraded conditions and marine communities common to the inner harbor continue in a seaward direction into the entrance channel. The first coral colonies to be seen are located 150 m seaward of the Makai Wharf along the eastern entrance channel wall and 100 m seaward along the western channel wall. It is not until 200 m seaward of the Makai Wharf that more native species become apparent such that by 250 m seaward, the usual complement of Hawaiian coral reef species are dominant. Thus there is a substantial "buffer zone" between the inner harbor dominated by alien species where redevelopment will take place and the native coral reef communities which are located well seaward. The present survey of the harbor found no fish, shellfish or crustacean species of commercial or recreational importance within the inner harbor.

In summary, the proposed redevelopment of Kewalo Basin should have little negative consequence to native marine species because the affected benthic communities are dominated by alien species that have broad geographic distributions. The proposed activities are occurring in a badly degraded environment with poor biological resources. Following completion of the work, the existing biological resources will undoubtedly re-establish themselves on the new substratum created by the redevelopment.

3. Life History Strategies of Coral Reef Organisms

The majority of all coral reef species have life history strategies that incorporate a pelagic larval phase. The pelagic larval phase may be abbreviated lasting only hours as in some polychaetes (Bailey-Brock 1987) to months as in the phyllosoma larvae of spiny lobsters (MacDonald 1984). Having a pelagic larval phase may aid in the dispersal of a species between island groups which may result in the "sharing" of genetic stocks thus keeping endemism low. Spawning in these species is usually timed with lunar/seasonal phases that are presumably matched with shifts in local currents which can assist in carrying gametes and weak swimming larval phases well away from shallow reefs where presumably predation is high on these vulnerable early life stages and to later bring the competent (i.e., ready to settle) larvae back into appropriate shallow water habitats where they recruit to the adult habitat.

Like many of the other species on coral reefs, coral reef fish utilize the same life history strategies. These life history strategies have been reviewed by Sale (1991), Polunin and Roberts (1996) and Birkeland (1997). Typically the life of a coral reef fish includes several stages. Often, spawning occurs in the vicinity of the reef and is characterized by frequent repetition throughout a protracted time of the year, a diverse array of behavioral patterns, and extremely high fecundity. The eggs of many species are fertilized externally and dispersed directly into the pelagic environment as plankton. Other species have demersal eggs, which upon hatching disperse larvae into the pelagic realm. Planktonic mortality is very high and unpredictable. Recruitment is the transition stage from the planktonic larval life to demersal existence on a coral reef. Recruitment is both spatially and temporally highly variable and the post larvae settle to a reef area. Mortality due to predation is high on newly settled recruits thus rapid growth out of the juvenile stage is a common strategy. Again like many other coral reef species, the dispersion of gametes and larvae in water currents determines the final location of the adults. The adults are often sedentary or territorial and the vastly different set of parameters that determine success in these two very different life history phases serve to complicate fisheries management (Birkeland 1997).

Life history strategies that depend upon currents have a profound impact on the diversity and abundance of coral reef species at any given location. Similarly, the proximity of adjacent islands (with coral reefs) plays a role in determining this diversity. Geographically isolated islands such as the Hawaiian Archipelago have a relatively low diversity of coral reef species due to geographic isolation but a high endemism compared to the islands in the southwest part of the Western Pacific region where there is a greater opportunity for sharing of genetic material. However, whether geographically isolated or not, coral reefs are noted for the diverse array of species but typically there are only a few that are consistently abundant. The majority of species are relatively uncommon or only episodically abundant and occur following rare or unusually successful recruitment (Birkeland 1997).

Recruitment of populations of coral reef organisms depends largely on the pathways of larval dispersal and "downstream" links. The majority of coral reef species are very fecund, but temporal variations in recruitment success have been recorded for some species and locations and these are probably related to spawning/larval stages chance matching to local currents. Many of the large, commercially-targeted coral reef animals are long-lived and reproduce for a number of years. This is in contrast to the majority of commercially-targeted pelagic species. Long-lived species in coral reef ecosystems are often characterized by complex reproductive patterns like sequential hermaphroditism, sexual maturity delayed by social hierarchy, multi-species mass spawnings, and spawning aggregations in predictable locations (Birkeland 1997).

Recruitment of coral reef species is limited by the high mortality of gametes and larvae, and also by competition for space to settle out on coral reefs. Predation intensity is high due to a disproportionate number of predators, which limits juvenile survival (Birkeland 1997). In response, some species reduce this predation by rapid growth characteristics up to sizes that are not as vulnerable. Among the species following this strategy are parrotfish and wrasses but their growth rates are relatively slow compared to pelagic species where growth rates are very high. Many tropical reef fish species grow rapidly to near-adult sizes and then growth decreases so there is little increase over the often protracted life span.

In summary, many coral reef fish and invertebrate species grow rapidly in size to reduce the impact of predation that is often very high on smaller individuals. Many of these species have long life spans, are very fecund with eggs and larvae that are planktonic which aids in dispersal. However, changes in currents may either assist or hinder successful recruitment to the adult habitat. These characteristics result in high temporal variability in the presence/absence and abundance of any given species within a reef.

In general, the reproductive strategy of planktonic eggs and weak swimming larvae often places them out into offshore waters. Because eggs and larvae enter the open-ocean pelagic realm, many species with this life history strategy suffer high predation by pelagic predators. Stomach content studies of tuna prey have shown that the larvae of most coral reef fish and invertebrate species are found within about 150 miles of land and/or reefs which is probably related to local currents. Seaward of this, the larval fish community is largely comprised of pelagic species (King and Ikehara 1956). In contrast, coral reef fish and invertebrate species with planktonic eggs and larvae spawning in semi-enclosed lagoons or those that have demersal eggs and/or produce advance-stage larvae, may result in the juveniles recruiting close to the point of parental spawning. This probably is the case for many of the sessile alien species found in Kewalo Basin. However, there may be some species in semi-enclosed lagoons that migrate to points well seaward of those locations for spawning as many coral reef fishes are known to do (Johannes 1981) and juveniles of some species may actively seek and recruit to harbors. The small number of juvenile coral reef fishes encountered in Kewalo Basin have undoubtedly settled and subsequently actively migrated from areas seaward of the harbor into it.

4. Description of the Action

Kewalo Basin presently covers 22 acres of submerged lands and has 143 slips as well as 9,160 lineal feet of moorage. Additional space for vessels is needed and the proposed project would increase the small craft moorage capacity of the existing Kewalo Basin Harbor. The proposed improvements would also include repair and/or replacement of the existing mooring infrastructure. These changes will encompass work on the piers only and no bulkhead changes are envisioned except to provide improvements to the existing utilities serving the piers. The project scope is limited to the submerged assets which includes anything within the water lot, up to and including the gangways to shore and utility connections. All work would take place within the existing harbor boundaries and no dredging is planned but pre-drilling and pile driving will be among the expected activities.

The final build-out of the harbor will be new construction, but the work will be phased over the next several years to meet budget programming, and will include a combination of:

- Repairs to the existing dock (mostly concrete repairs to the topsides);
- Demolition of the existing fixed piers;
- Addition of new piers of either floating or fixed construction or both;
- New water/electrical/sewer utilities throughout the basin.

The preferred alternative would increase the number of slips by about 75% and increase the total linear moorage capacity by about 45% (to 250 slips and approximately 13,100 lineal feet of moorage). The proposed full build-out development will include the demolition of all existing in-water infrastructure, including Piers A, B, C and D, as well as the front row of commercial vessel slips adjacent to Ala Moana Boulevard, and the Makai Wharf. The existing piers A, B, C alignments will be replaced by longer piers and the front row slips will be reconstructed. The

Makai Wharf will be replaced by a longitudinal berth adjacent to the wharf. A fueling dock is proposed, extending ewa from the existing Makai Wharf into the harbor channel. The proposal includes two new piers for small to medium-sized vessels and a single jetty pier on the Fisherman's Wharf side of the harbor. Upland work will be limited to some localized utility trenching that may be necessary for utility improvements; however these are expected to be limited to the areas directly adjacent to the existing piers.

5. Analysis of Potential Adverse Impacts on EFH

Considering the biological resources in the Kewalo Basin project area, the many years of pollution and the documented increasing numbers/dominance of non-native species successfully colonizing the harbor, much of the aquatic biota today is comprised of species with cosmopolitan distributions, and are found in many harbors around the world. These species have become the visually-apparent dominant marine benthos in Kewalo Basin inner harbor/entrance channel and this fouling community is found on hard substratum (pier pilings, bulkheads as well as on refuse on the bottom). The substratum of the inner harbor bottom is a mix of mud, silt, muddy sand and refuse. Burrowing species are present in this soft bottom as noted by their holes. Very few fishes are seen in the inner harbor and other than the dominant alien black-chin tilapia, most of these are found in proximity to the harbor's entrance channel. Thus the inner harbor is biologically degraded and few native species are present.

The degraded conditions and marine communities common to the inner harbor continue in a seaward direction into the entrance channel. The first coral colonies to be seen are located 150 m seaward of the Makai Wharf along the eastern entrance channel wall and 100 m seaward along the western channel wall. It is not until one is 200 m seaward or more from the Makai Wharf that native coral reef species become apparent such that by 250 m seaward, the usual complement of Hawaiian coral reef species are dominant. Thus there is a substantial "buffer zone" between the inner harbor dominated by alien species where redevelopment will take place and the native coral reef communities which are located well seaward. No fish, shellfish or crustacean species of commercial or recreational importance were observed within the inner harbor.

In any case, the biologically-degraded, alien-dominated communities in the harbor are those that can successfully compete for resources; few native species are present and when seen are in relatively low abundance/coverage with many of them being found in proximity to the harbor's entrance channel. These findings support the contention that the physical and chemical conditions in Kewalo Basin are not favorable for many coral reef species thus their recruitment to the harbor is greatly diminished. The environmental conditions in Kewalo Basin have not been favorable for native Hawaiian coral reef species for a long time. Coles *et al.* (1999b) found the benthic communities to be highly disturbed with many alien species present and the present study twelve years later has found the dominance of alien species to have increased.

As noted above, the goal of EFH is to protect economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats which protect all life stages of all species of concern must be maintained. Because Hawai'i's inshore fisheries are totally dependent upon the coral reef ecosystem in which they occur, an ecosystem approach to this protection and conservation has been taken by the WPRFMC for determination of EFH effects on coral reefs. Presently there is little recruitment of any native coral reef species into Kewalo Basin because both the chemical and biological conditions are not suitable for most native coral reef species. Thus it could be argued that the harbor should not be considered further in terms of essential fish habitat for Hawaiian coral reef species. Furthermore, since there is a substantial buffer zone in the Kewalo Basin entrance channel between the area considered for proposed improvements and the normal coral reef environment dominated by native species located more than 200 m seaward, concern that the proposed construction will impact EFH are not warranted.

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Traffic Assessment

Traffic Assessment of the Kewalo Basin Improvements
Honolulu, Hawaii

August 18, 2010

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Honolulu, Hawaii

August 18, 2010

Introduction

A master plan is being developed for improvements at Kewalo Basin on the south shore of Oahu (Figure 1). The plan will increase the number of slips available for the various uses in the harbor while maintaining existing landside access to support areas. Vehicular access will continue at existing locations and the increase in slips is expected to increase landside traffic and parking demand. The master plan is a 15-year plan, with the increase in the number of slips expected to occur over a number of years, as funding becomes available. A Phase 1 of the project that will demolish 58 slips and provide 79 new slips, for a net gain of 21 slips, has been identified for completion by the end of 2012.

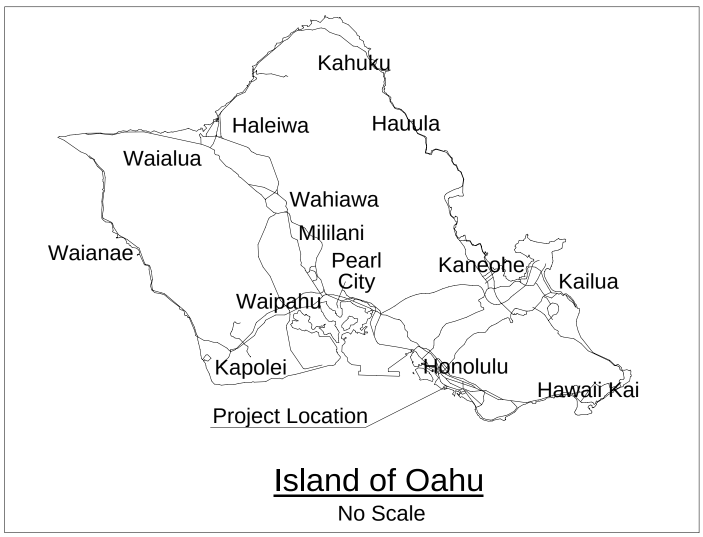

Figure 1 – Project Location

A traffic assessment was conducted to identify the potential impact due to these improvements. The assessment has found that, while traffic volumes in the area are expected to increase dramatically during the time that the master plan will be implemented, the landside traffic impact of the improvements at Kewalo Basin are expected to be less than 100 vehicles per hour in the peak direction, and these increases would not have any significant impacts to future traffic conditions.

Vehicular Access and Existing Traffic Conditions

Figure 2 shows Kewalo Basin and the roadways in its immediate vicinity. Existing vehicular access to Kewalo Basin occurs at three roadway connections to Ala Moana Boulevard, a State highway (Route 92) functionally classified as a principal arterial roadway and intended to move traffic between regions. Route 92 runs between Interstate Route H-1 at Keehi Interchange in Kalihi northwest of downtown Honolulu and Waikiki to the southeast of Kewalo Basin.

Basemap (aerial photograph) from maps.google.com

Figure 2 – Existing Vehicular Access

Near Kewalo Basin, Ala Moana Boulevard runs in a generally east-west direction and is located north (mauka) of Kewalo Basin. Ala Moana Boulevard is a six- to eight-lane roadway with a median separating three through lanes of traffic in each direction. Along a portion of the Kewalo Basin frontage, the median consists of a striped left turn lane for westbound traffic approaching the Ward Avenue intersection. Along most of the frontage, however, the eastbound and westbound lanes are separated by a raised, curbed medial strip landscaped with grass, shrubs, and trees. East of Kewalo Basin, the Ala Moana Boulevard median includes a cutout for a left turn lane serving eastbound traffic approaching the nearby signalized intersection with Kamakee Street. A fourth westbound lane on the approach to Ward Avenue serves as a right turn only lane.

A fourth eastbound lane, running for approximately 100 feet eastwardly from the Ward Avenue intersection; serves as a right turn only lane into Kewalo Basin, through a one-way driveway entering the Kewalo Basin parking lot. Left turns into this driveway were also observed from the westbound left turn lane. This driveway provides direct access to two parking lots, currently used by off-site employees, behind the old Fisherman's Wharf building. This driveway also provides access to parking and loading areas between the building and the west side wharf, and to a service roadway and bus/van loading areas parallel to Ala Moana Boulevard along the front (*mauka*) portion of Kewalo Basin.

The second connection to Ala Moana Boulevard is a one-way driveway for traffic exiting the front portion of Kewalo Basin, located approximately 800 feet east of Ward Avenue at the end of the loading area; exiting traffic is controlled by a stop sign and restricted to right turns only.

A "T"-intersection controlled by a traffic signal is the third connection to Ala Moana Boulevard. Located approximately 1,150 feet east of Ward Avenue, this intersection is used by traffic leaving both the Kewalo Basin area and the Kewalo Basin Park, located south (*makai*) of Kewalo Basin itself; the park includes approximately 110 marked parking stalls for public use. Separate lanes are provided for left turns and for right turns onto the highway at the northbound approach of the signalized intersection. Right turns into the site (Kewalo Basin support areas and the park) can be made from a shared lane in the eastbound direction of Ala Moana Boulevard.

Vehicular access to Kewalo Basin is also available through a two-lane, two-way roadway connected to Ahui Street, a minor street that is part of the street grid serving the Kaka`ako Makai area located adjacent to and west of Kewalo Basin. Ahui Street intersects with Ala Moana Boulevard at an unsignalized intersection, where turning movements are limited to right turns from or to the eastbound lanes of Ala Moana Boulevard. Between the Kewalo Basin driveway and Ala Moana Boulevard, Ahui Street intersects with Ilalo Street, which to the east curves to meet Ala Moana Boulevard as the south (*makai*) leg of the signalized Ward Avenue intersection. Several other streets that run parallel to Ahui Street to the west intersect with Ala Moana Boulevard at signalized intersections; these streets provide alternative routes in and out of the Kaka`ako Makai area.

Recent available traffic data in the area include machine traffic counts taken as part of the regular counting program for the State Highways Division; Table 1 shows the averages (to the nearest 5 vehicles) of the data from the counts taken in 2007 at two locations: on Ala Moana Boulevard east of Ward Avenue, and on Ward Avenue north of Ala Moana Boulevard. On Ala Moana Boulevard, peak hours occurred between 7:15 AM and 8:15 AM and between 5:00 PM and 6:00 PM. Peak hour volumes were recorded between 7:15 AM and 8:15 AM and between 4:30 PM and 5:30 PM on Ward Avenue.

Table 1 – Traffic Count Data from State Highways Division

	Average of two days' counts, (vehicles per day)	AM Peak Hour (vehicles per hour)	PM Peak Hour (vehicles per hour)
Ala Moana Boulevard, east of Ward Avenue (November 27-28, 2007)			
Westbound	21,960	1,525	1,505
Eastbound	23,275	1,535	1,795
Total two-way	45,235	3,060	3,300
Ward Avenue, north of Ala Moana Boulevard, (September 25-26, 2007)			
Southbound	11,320	640	930
Northbound	14,520	860	1,120
Total two-way	25,840	1,500	2,050
Source: State of Hawaii, Department of Transportation, Highways Division. *Hawaii DOT Traffic Station Maps 2007* (CD).			

The counts shown in Table 1 indicate that peak hour volumes on Ala Moana Boulevard were 6.8% of daily volume in the AM Peak Hour and 7.3% of daily volume in the PM Peak Hour. On Ward Avenue, peak hour volumes were 5.8% of daily volume in the AM Peak Hour and 7.9% of daily volume in the PM Peak Hour.

Ahui Street is a two-way street with parallel curbside parking allowed along one side of the street. The Ahui Street driveway, which connects to the back portion of the parking lot fronting the Fisherman's Wharf building on the west (*ewa*) side of Kewalo Basin, carries two-way traffic. As only right turns from and to the eastbound lanes of Ala Moana Boulevard are permitted at the Ahui Street intersection, vehicles from the westbound lanes of Ala Moana Boulevard can access Ahui Street by turning left at the signalized intersection at Ward Avenue (the Ward Avenue extension becomes Ilalo Street), then left again at Ahui Street. Vehicles leaving Kewalo Basin via Ahui Street can access the westbound lanes of Ala Moana Boulevard by turning left either at the Ward Avenue intersection or from several other streets at signalized intersections via Ilalo Street. No recent traffic counts are available for Ahui Street, but it is estimated to carry volumes of less than 100 vehicles per hour and 1,000 vehicles per day, based on field observations.

As part of a traffic study[1] for the Kaka`ako Mauka Area plan (*mauka* of Ala Moana Boulevard), peak period manual traffic counts were taken in 2008 at various intersections in the area. These counts were used in developing peak hour traffic assignments reported in the traffic study report for the Kaka`ako Mauka plan. A review of these "existing traffic assignments" for year 2008 and existing traffic conditions showed ly worse conditions occurred at the Ward Avenue intersection as compared to the other nearby signalized intersections (at Cooke Street and Coral Street) serving the Kaka`ako Makai area. Significant variations from the 2007 machine counts reported by the Highways Division were also evident. Therefore, additional peak period manual traffic counts were taken as part of this traffic assessment for the Kewalo Basin project at the Ward Avenue and Kewalo Basin access signalized intersections with Ala Moana Boulevard.

The peak period turning movement counts and additional field observations were taken on two weekdays in February 2010. The field observations indicated high volumes of traffic and some congestion on Ala Moana Boulevard and on Ward Avenue, but minimal volumes and no congestion into and out of Kewalo Basin and on the streets in Kaka`ako Makai near Kewalo Basin. While not counted separately, much of the traffic entering and leaving Kewalo Basin was observed to be due to vehicles parked within the Kewalo Basin lots by people who walked over from nearby office buildings and to users of the Kewalo Basin Park located between Kewalo Basin and the ocean.

The highest hourly volumes of traffic entering and exiting the Kewalo Basin area were recorded in the morning between 7:30 AM and 8:30 AM (230 vehicles total) and in the afternoon between 5:15 PM and 6:15 PM (281 vehicles total). The count data is summarized in Appendix A.

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1 DMJM Harris, *Kakaako Mauka Area Plan, Supplemental Environmental Traffic Impact Statement Transportation Analysis Final Report*, April 14, 2009.

The traffic signal at the intersection of Ala Moana Boulevard and Ward Avenue operated in six phases. Left turns in each direction from Ala Moana Boulevard were made during two signal phases that preceded the opposing through movements (two phases); Ward Avenue traffic was served by (two) split phases that followed the phases for through traffic on Ala Moana Boulevard. Field observations indicated that the left turn phases were demand-actuated, as were the cross-street and pedestrian signals for crossing Ala Moana Boulevard (pedestrian phases for crossing Ala Moana Boulevard were set to avoid conflicts with left turn traffic). The signal was observed to operate at an average cycle length of 140 seconds during the peak periods.

The traffic signal at the east driveway to Kewalo Basin operated in two phases, one allowing traffic on Ala Moana Boulevard to proceed, the second stopping traffic on Ala Moana Boulevard to allow left turns out from Kewalo Basin. Pedestrian crossing of Ala Moana Boulevard is not permitted at this intersection. This signal also cycled at 140 seconds and appeared to be coordinated with the nearby signal at Ala Moana Boulevard and Kamakee Street (350 feet to the east), from which eastbound queues of fifteen or more vehicles per lane were observed to back through the Kewalo Basin intersection.

The manual counts, when compared with the machine counts (Table 1), were slightly higher on Ala Moana Boulevard and somewhat lower on Ward Avenue. From the manual counts, existing weekday volumes are estimated to be 51,500 vehicles per day on Ala Moana Boulevard and 10,800 vehicles per day on Ward Avenue. Peak hourly volumes from the Kaka`ako study and the manual counts are compared in Table 2. Existing peak hour volumes, based on the manual counts taken in February 2010, are shown in Figure 3.

Table 2 – Comparison of Peak Hour Traffic Counts

		AM Peak Hour		PM Peak Hour	
		2008	2010 count	2008	2010 count
Ala Moana Boulevard and Ward Avenue	eastbound approach	1,766	1,874	2,088	2,380
	northbound approach	51	58	233	124
	westbound approach	2,179	1,880	1,731	1,823
	southbound approach	478	456	658	520
	Total of all approaches	4,474	4,268	4,710	4,847
Ala Moana Blvd. & Kewalo Basin	eastbound approach	1,522	1,721	2,100	2,454
	northbound approach	62	75	113	88
	westbound approach	2,164	2,031	1,544	1,682
	Total of all approaches	3,748	3,827	3,757	4,224

Note: 2008 from DMJM Harris | AECOM, *Kaka`ako Mauka Area Plan, Supplemental Environmental Impact Statement, Transportation Analysis, Final Report*, April 14, 2009

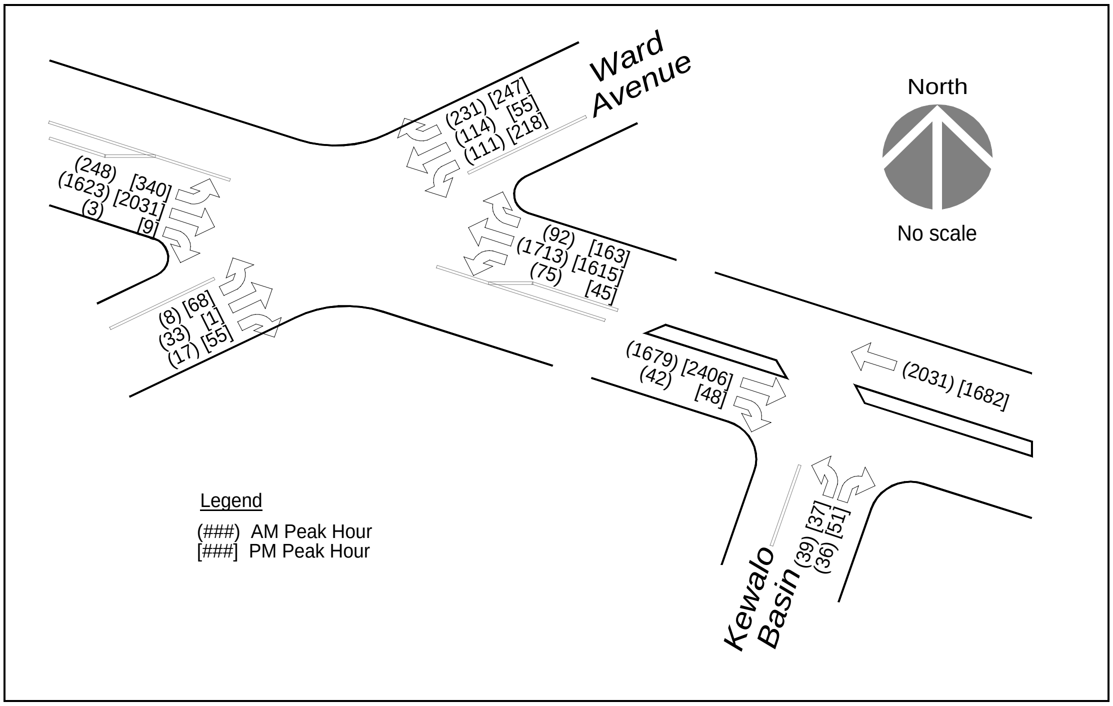

Figure 3 – 2010 Peak Hour Traffic Assignments

A "level of service" is a qualitative description of traffic conditions used by traffic engineers. Level of service analyses of the two signalized intersections nearest Kewalo Basin were done for the peak hours determined from the count data. The analyses were based on procedures described in the *Highway Capacity Manual*, which determine capacities, average delays, and levels of service for each movement and for overall intersection conditions. The criteria for Levels of Service, based average delay, are:

Average Delay (seconds per vehicle)	General Description of Delay	Level of Service (LOS)
≤ 10	Little or no delay	A
> 10 and ≤ 20	Short traffic delays	B
> 20 and ≤ 35	Average traffic delays	C
> 35 and ≤ 55	Long traffic delays	D
> 55 and ≤ 80	Very long traffic delays	E
>80	Very long traffic delays	F

In urban areas, peak hour Level of Service (LOS) D is considered acceptable.

Table 3 shows the results of the analysis; worksheets from the analysis are included in Appendix B. While there are very long delays for some movements, the overall intersection level of service is acceptable.

Table 3 – Existing Levels of Service at Signalized Intersections

Intersection	Movement	AM Peak Hour v/c	AM Peak Hour AD	AM Peak Hour LOS	PM Peak Hour v/c	PM Peak Hour AD	PM Peak Hour LOS
Ala Moana Boulevard and Ward Avenue	eastbound left turns	0.90	88.7	F	0.87	72.5	E
	westbound left turns	0.65	87.4	F	0.40	71.9	E
	westbound throughs	0.80	35.0	D	0.91	48.2	D
	eastbound approach	0.60	21.1	C	0.78	26.1	C
	southbound approach	0.60	58.1	E	0.68	57.8	E
	northbound approach	0.16	60.9	E	0.54	69.6	E
	Overall intersection	**0.72**	**36.1**	**D**	**0.83**	**41.2**	**D**
Ala Moana Blvd. & Kewalo Basin	eastbound approach	0.48	5.6	A	0.70	8.2	A
	northbound approach	0.19	55.4	E	0.27	56.5	E
	westbound throughs	0.56	6.4	A	0.48	5.6	A
	Overall intersection	**0.51**	**7.0**	**A**	**0.64**	**8.2**	**A**

v/c = utilization or volume/capacity ratio AD = average delay (seconds)
LOS = Level of Service

At the Ward Avenue intersection, very long delays for the left turn movements from Ala Moana Boulevard were due to the combination of the demand-actuated phasing and the long signal cycle. Very long delays occurred on the southbound Ward Avenue approach because of the combination of the demand actuated phasing and the long signal cycle. The low vehicular utilization and less delay on the northbound approach were the result of the longer green time provided for that phase to satisfy pedestrian crossing requirements.

At the two-phase signal at the Kewalo Basin roadway, the delays on the northbound approach were very long due to the demand actuated phasing and the long signal cycle. Additional delays from the multi-phase Kamakee Street signal, which are not shown in the table, often resulted in eastbound queues backing through the Kewalo Basin intersection.

Existing Transit Service in the Area

Existing transit service in the area is provided by the City's *TheBus* system. One local route travels on Ilalo Street and Ala Moana Boulevard with current weekday service at headways of approximately 70 minutes. Four express routes and six local routes use Ala Moana Boulevard, with midday service on weekdays totaling approximately 13 buses per hour. One route travels on Auahi Street and Ward Avenue, providing approximately 3 buses per hour.

Future Traffic Conditions in the Area

Significant growth in traffic volumes along Ala Moana Boulevard has been projected by other studies. An extensive traffic study that was part of the Supplemental Environmental Impact Statement for the Kaka`ako Mauka project indicates that peak hour traffic volumes are expected to increase at average rates of between 2½% and 3% per year from 2008 to 2030. The report discloses findings of future over-capacity conditions and poor levels of service at all intersections in the area, but does not provide recommendations for adequate mitigation.

The impact of the proposed project will not occur immediately, as the increase in the number of slips will probably be implemented over a number of years. A first phase that will result in a net gain of 21 slips has been identified for completion by the end of 2012. The master plan is for fifteen years and future conditions for year 2025 were evaluated to identify the impacts of full implementation and use of the master plan. The future baseline (without the Kewalo Basin project) traffic projections were developed for proportionate increases in traffic, using the projections from the Kaka`ako Mauka plan.

Figure 4 shows the 2012 Baseline (without project) peak hour traffic assignments and Figure 5 shows the 2025 Baseline peak hour traffic assignments.

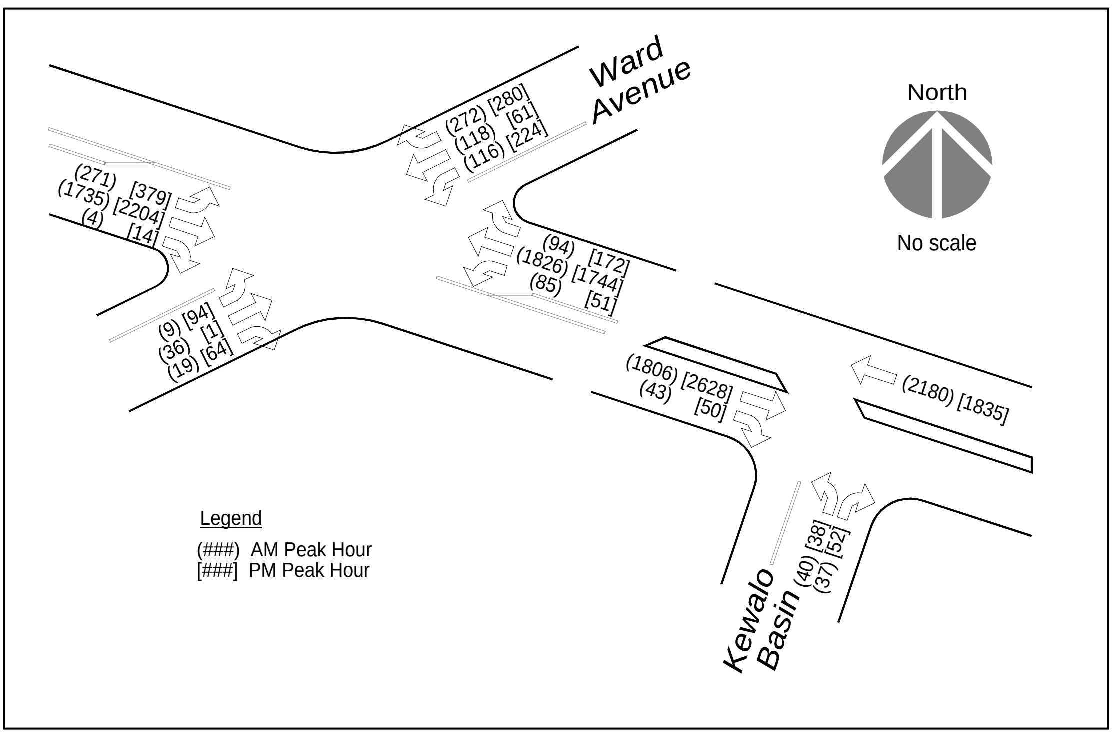

Figure 4 – 2012 Baseline Peak Hour Traffic Assignments

Table 4 shows the results of the level of service analyses of the 2012 Baseline peak hour traffic assignments.

Table 4 – 2012 Baseline Levels of Service at Existing Signalized Intersections

		AM Peak Hour			PM Peak Hour		
		v/c	AD	LOS	v/c	AD	LOS
Ala Moana Boulevard and Ward Avenue	eastbound left turns	0.98	106.5	F	0.97	90.2	F
	westbound left turns	0.76	99.3	F	0.45	74.2	E
	westbound throughs	0.87	38.7	D	0.98	58.9	E
	eastbound approach	0.67	22.6	C	0.85	29.1	C
	southbound approach	0.73	61.9	E	0.72	59.5	E
	northbound approach	0.19	61.3	E	0.63	72.8	E
	Overall intersection	**0.78**	**39.9**	**D**	**0.91**	**47.7**	**D**
Ala Moana Blvd. & Kewalo Basin	eastbound approach	0.52	5.9	A	0.76	9.5	A
	northbound approach	0.14	55.5	E	0.27	56.6	E
	westbound throughs	0.61	6.8	A	0.52	5.9	A
	Overall intersection	**0.54**	**7.3**	**A**	**0.69**	**9.0**	**A**

v/c = utilization or volume/capacity ratio AD = average delay (seconds)
LOS = Level of Service

The modest increases in traffic volumes from 2010 will result in slightly higher utilization and small increases in delay

Similar analyses of the 2025 traffic assignments result in overall utilizations of 1.04 in the AM Peak Hour and 1.27 in the PM Peak Hour at the intersection of Ala Moana Boulevard and Ward Avenue. For utilization greater than 1.1, such as found for the 2025 PM Peak Hour, delay computations would not be meaningful. For the 2025 peak hours, therefore, a simplified critical movement analysis was used to identify the potential impact of the proposed project.

In the critical movement analysis, peak hour volumes placed in lane groups (single lane or grouping of lanes that can be served by a common signal phase). Volumes are computed on a per lane basis and conflicting movements (those that cannot be served at the same time) are summed. A sum greater than 1,400 is considered over capacity. A critical movement sum of 1,688 was computed for the 2025 PM Peak Hour at the intersection of Ala Moana Boulevard and Ward Avenue.

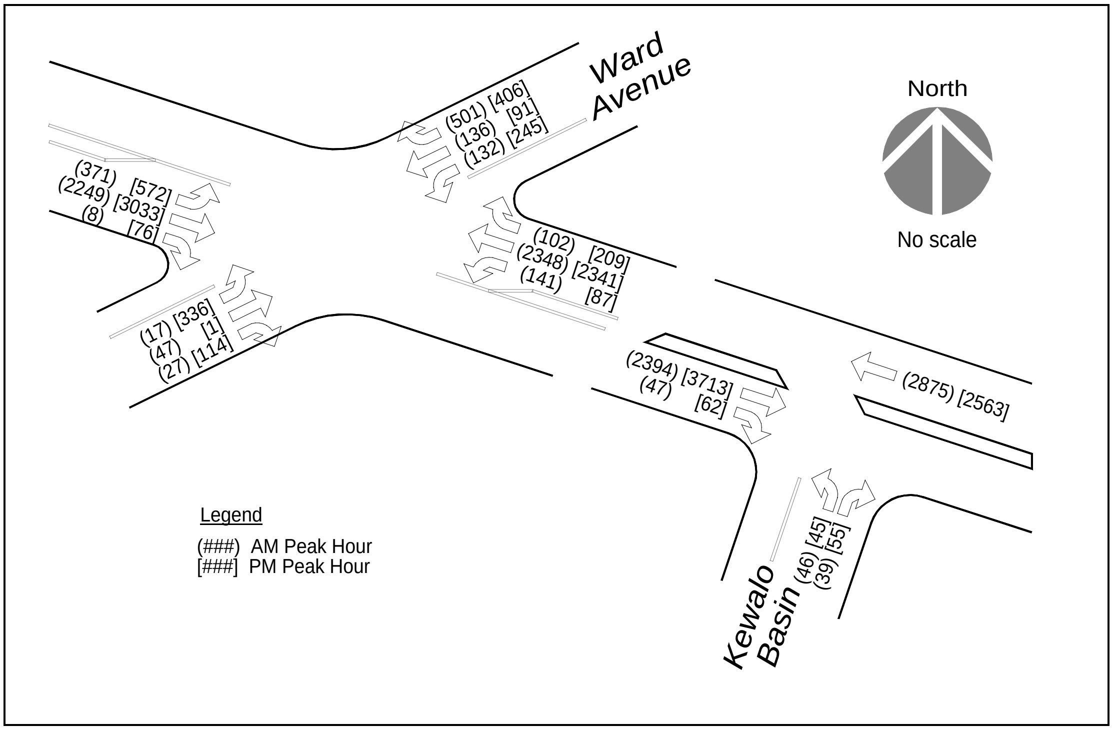

Figure 5 – 2025 Baseline Peak Hour Traffic Assignments

Future Transit Service in the Area

No significant changes in transit service is expected to occur by 2012. Adjustments in scheduling could occur as the operator strives to make more efficient use of the bus fleet. By 2025, Honolulu will see a change in transit services with the implementation of the Honolulu High-Capacity Transit Corridor Project, which is expected to be in service along Halekauwila Street, two blocks north of Ala Moana Boulevard. The service will extend from East Kapolei in leeward Oahu through downtown Honolulu to Ala Moana Center, with a total of 19 stations over a distance of 19 miles.

The plans show a Kaka`ako Station located southeast of Ward Avenue, approximately 1,200 feet northeast of the intersection of Ala Moana Boulevard and Ward Avenue. The transit project will feature a fixed guideway rapid transit and some adjustments in bus service will be implemented as part of the project. While the traffic forecasts from the Kaka`ako Mauka study assumed that the fixed guideway will be in service, the high capacity of the proposed transit improvements will provide additional opportunities to address the projected high vehicular traffic volumes in the area.

Traffic Impact of Proposed Project

The proposed project will not change vehicular access patterns into or out of Kewalo Basin. At full development, the project will reconfigure the mooring within the basin, resulting in an additional 107 slips, or a 75% increase in the number of slips (the number of slips increases from 143 to 250). Two estimates of the project traffic impact were made, and the higher estimates were used in the level of service analyses.

The first estimate used trip rates compiled by the Institute of Transportation Engineers and published in the *Trip Generation* manual, which are commonly used in traffic studies. The trip rates for "Marina" from *Trip Generation* were used. The *Trip Generation* manual describes the use as "public or private facilities that provide docks and berths for boats and may include limited retail and restaurant space." The rates per berth from that reference were applied to the additional number of slips that will be added by the project, as shown in Table 6 (daily totals are shown to nearest 5).

Table 6 – Trip Generation Estimate (Marina)

	Trip rates *		For 21 new slips		for 107 new slips	
	Trip rate	% entering	enter	exit	enter	exit
Average Weekday	2.96	50%	30	30	160	160
AM Peak Hour of adjacent street	0.08	33%	1	1	3	5
AM Peak Hour of generator	0.17	64%	2	1	12	7
PM Peak Hour of adjacent street	0.19	60%	2	2	12	8
PM Peak Hour of generator	0.21	51%	2	2	11	11
Saturday	3.22	50%	35	35	175	175
Peak Hour	0.27	44%	2	3	13	16
Sunday	6.40	50%	65	65	345	345

* Source: Institute of Transportation Engineers. *Trip Generation, 8th Edition*.

Traffic impact based on the trip rates for a marina would be minimal. The highest hourly impact is less than 30 vehicles per hour in the both directions at full development, considerably less than a published criterion[2] for significant impact of 100 vehicles per hour.

2– Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development*. Washington, D.C., 2005

The second estimate of project traffic impact used the field count data and field observations to develop site-specific trip factors. Table 7 shows the parking in the area and calculations of peak hour traffic impact, based on field observations of parking usage and turnover. While harbor-related parking (shown in Table 7 in italics) is about 45% of the total stalls, much of the parking designated for harbor use was not occupied, and turnover was low during peak periods. The estimated contribution of harbor-related traffic to peak hour traffic volumes, as shown in Table 7, is one-third of the total traffic in and out of the Kewalo Basin area (the estimates of turnover were done as a "high range" estimate and any detailed study based on recorded data would result in a lower trip rate).

Table 7 – Trip Generation Based on Parking Areas in Kewalo Basin

# of stalls *	Parking Location	User type	estimated traffic impact	
35	Unpaved parking behind Fisherman's Wharf	permittee	15%	6
63	Paved parking behind Fisherman's Wharf	permittee	50%	32
24	*Paved parking in front of Fisherman's Wharf*	*harbor*	*25%*	*6*
26	*Paved parking on Loading Dock*	*harbor*	*10%*	*3*
37	*Along Front Row Island*	*harbor*	*15%*	*6*
15	*In front of Charter Building*	*harbor*	*100%*	*15*
2	*Next to Charter Building*	*harbor*	*100%*	*2*
72	*Diamond Head/Ala Moana parking lot*	*harbor*	*25%*	*18*
22	*Diamond Head wharf*	*harbor*	*50%*	*11*
15	*Along Makai Wharf*	*harbor*	*50%*	*8*
3	*Along NOAA fenced lot*	*harbor*	*50%*	*1*
24	In NOAA lot	(closed)	0%	0
30	Gravel lot, former Mammal Research Lab	permittee	10%	3
110	Kewalo Basin Park	park	90%	99
478	**Total parking stalls**	***traffic impact estimate total***		**210**
216	*(45% of stalls) available to harbor users*	*due to harbor uses*		*70*
* Source: Hawaii Community Development Authority.				

Table 8 shows the second estimate of project traffic for full development. While these volumes are higher than the estimates based on the trip rates from *Trip Generation,* project impact would still be less than significant (100 vehicles per hour) in the peak hour.

Table 8 – Traffic Generation Using Site-Specific Rates

	One-third of existing traffic (143 slips)			Trip rates (per slip)		For 21 slips (Phase 1)		For 107 slips	
	enter	exit	total	trip rate	% entering	enter	exit	enter	exit
AM Peak Hour	36	29	65	0.45	63%	6	4	31	18
PM Peak Hour	51	43	94	0.66	54%	7	6	38	32

The higher traffic estimates based on the counted traffic were distributed and assigned to the roadway system in proportion to existing traffic. Phase 1 project impacts to peak hour volumes are shown in Figure 5 and future peak hour volumes with the addition of project traffic are shown in Figure 6. Table 9 shows the results of the level of service analyses (only minor impacts compared to baseline conditions in Table 4).

Table 9 – 2012 Levels of Service at Existing Signalized Intersections (with Project, Phase 1)

		AM Peak Hour			PM Peak Hour		
		v/c	AD	LOS	v/c	AD	LOS
Ala Moana Boulevard and Ward Avenue	eastbound left turns	0.98	106.5	F	0.97	90.2	F
	westbound left turns	0.79	102.7	F	0.47	75.0	E
	westbound throughs	0.87	38.7	D	0.98	59.0	E
	eastbound approach	0.67	22.6	C	0.85	29.1	C
	southbound approach	0.73	62.1	E	0.74	60.0	E
	northbound approach	0.20	61.5	E	0.64	73.2	E
	Overall intersection	**0.79**	**40.0**	**D**	**0.91**	**47.9**	**D**
Ala Moana Blvd. & Kewalo Basin	eastbound approach	0.52	5.9	A	0.76	9.5	A
	northbound approach	0.20	55.7	E	0.29	56.9	E
	westbound throughs	0.61	6.8	A	0.52	5.9	A
	Overall intersection	**0.55**	**7.4**	**A**	**0.69**	**9.1**	**A**
v/c = utilization or volume/capacity ratio AD = average delay (seconds) LOS = Level of Service							

Figures 7 and 8 show the peak hour volumes for year 2025. Table 10 shows the critical movement sums, which illustrate that project impact will not be significant.

Table 10 – Critical Movement Sums

Ala Moana Boulevard and:	Ward Avenue		Kewalo Basin access	
Peak Hour:	AM	PM	AM	PM
2010 (counted)	952	1,164	716	869
2012 Baseline	1,019	1,278	767	945
2012 with Phase 1	1,021	1,282	769	959
2025 Baseline	* 1,479	* 1,563	1,099	1,246
2025 with project	* 1,481	* 1,582	1,112	1,268
* Note: sums higher than 1,400 are considered over capacity				

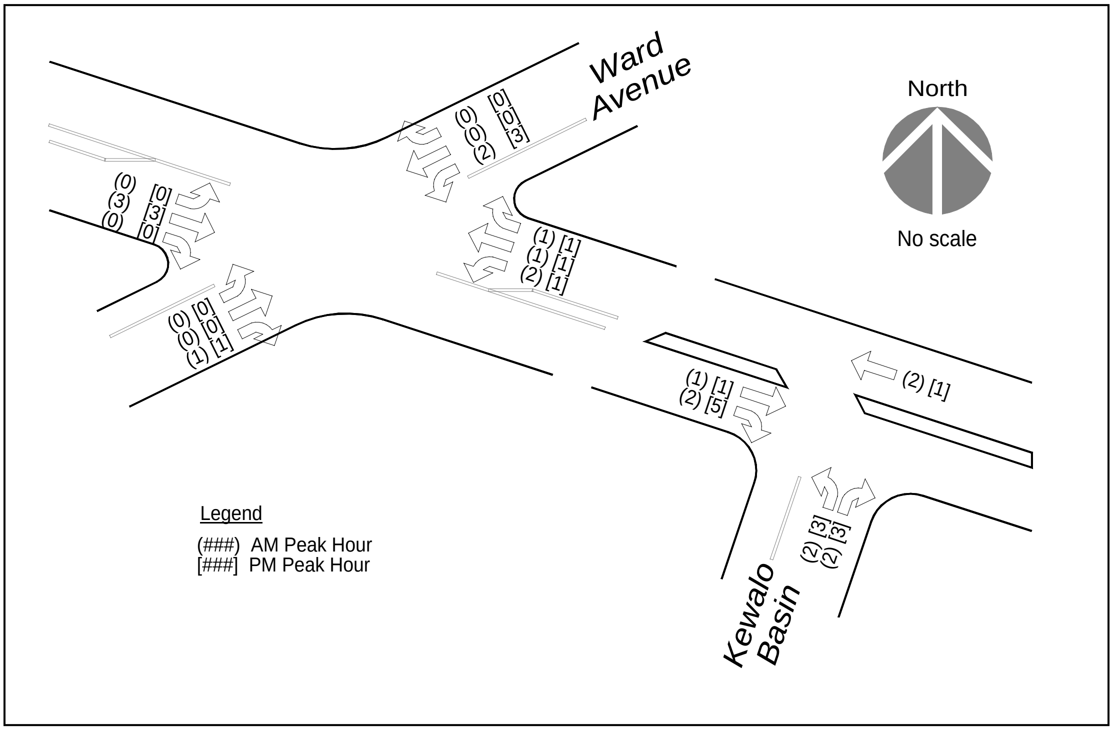

Figure 5 – Phase 1 Project Peak Hour Traffic Impact

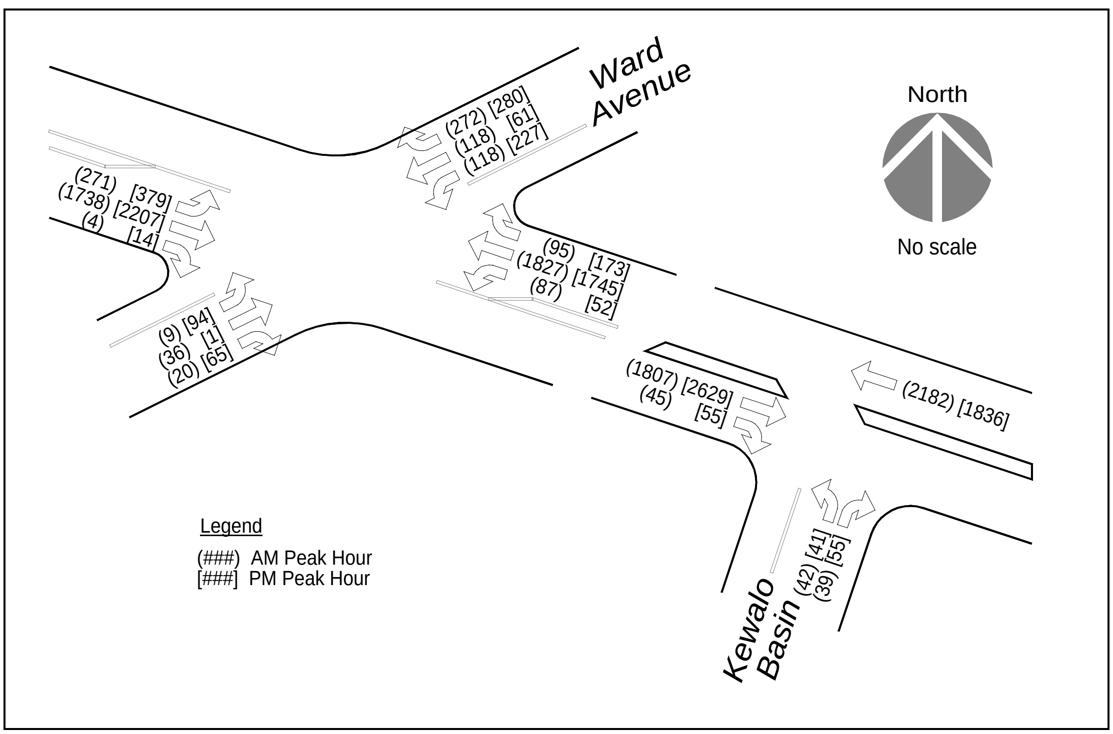

Figure 6 – 2012 with Project (Phase 1) Peak Hour Traffic Assignments

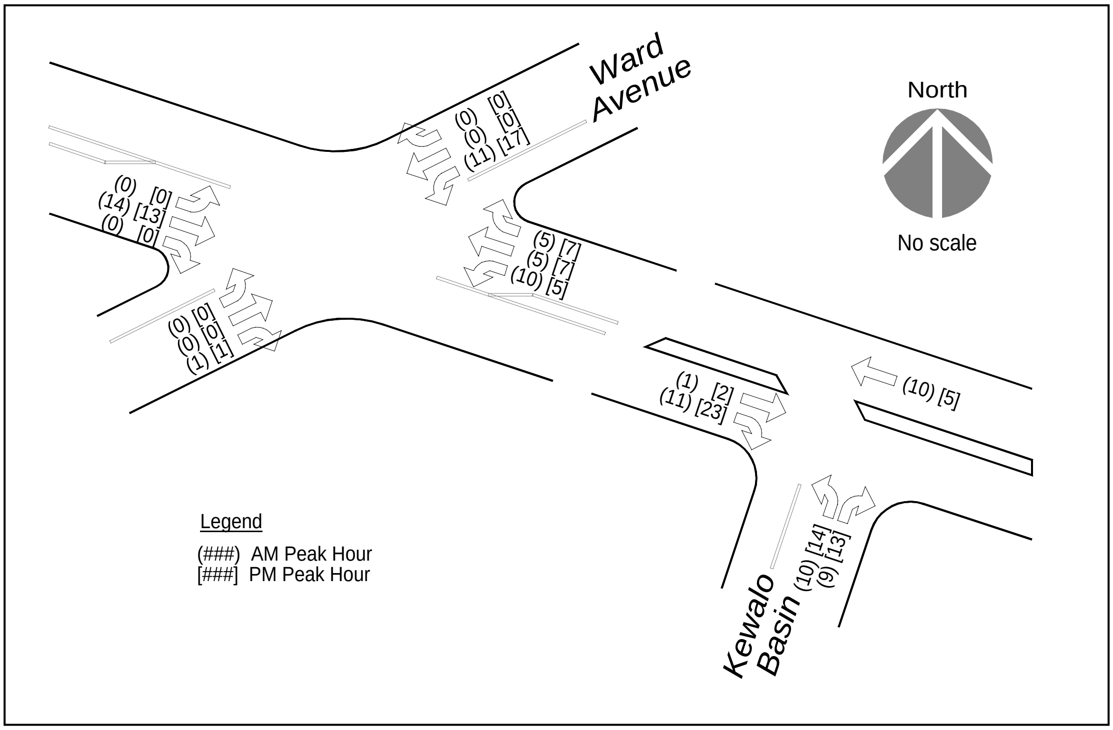

Figure 7 – Project Peak Hour Traffic Impact (Full Development)

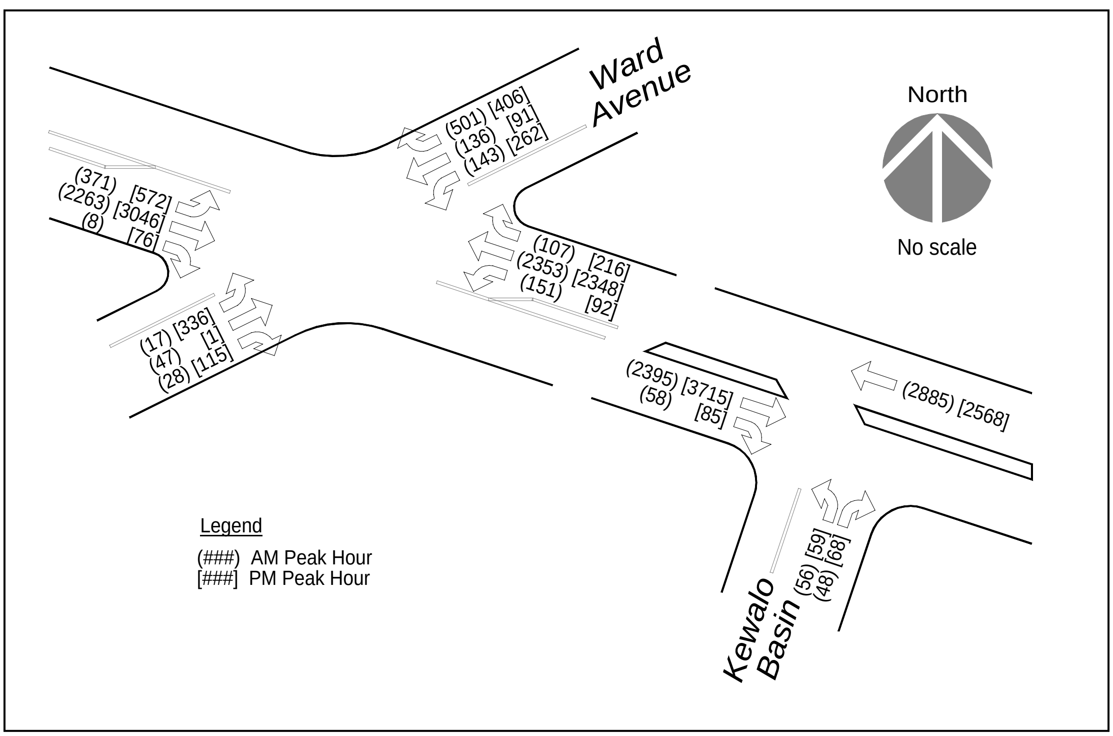

Figure 8 –Traffic Assignments – 2025 Peak Hour Plus Project

Conclusions

The additional traffic generated by the proposed project will not have a significant impact to peak hour traffic conditions. The first phase of the project is expected to be completed by the end of 2012, and the traffic analyses show acceptable overall levels of service at the nearby signalized intersections, along with very small changes in volumes and delays when compared to a no-build case.

For the longer term, completion of the Kewalo Basin master plan is expected to occur over a number of years. Considering a horizon of 15 years, traffic conditions will be affected more by traffic increases due to other development than by the completion of the master plan for Kewalo Basin. The worst traffic conditions are expected in the PM Peak Hour, where projected volumes would exceed the intersection capacity without or with the addition of project traffic. Critical movement sums at the intersection of Ala Moana Boulevard and Ward Avenue in the PM Peak Hour would increase by 1.2% with the addition of project traffic, as utilization increases from 1.12 to 1.13.

The additional traffic entering and exiting areas that support the Kewalo Basin improvements will have a minor effect on pedestrian and bicycle movements along Ala Moana Boulevard. Requirements for drivers crossing sidewalks to yield to pedestrians and for drivers to share the road with other vehicles, including bicycles, will not change and the analysis has shown that the project will have only a small effect on the vehicular volumes.

The analyses found that peak hour traffic conditions would be acceptable without or with the project and no mitigation measures have been identified. For the additional slips and activity that is expected with the completion of the entire master plan, the analysis showed that the effect on traffic volumes will be minor and the poor levels of service that have been identified without any changes at Kewalo Basin would not change. No roadway mitigation measures will be necessary because of the proposed Kewalo Basin master plan.

Appendix A: Summary of Manual Counts (one page)

Appendix A: Summary of Manual Counts

intersection count - Ala Moana Boulevard & Ward Avenue, Thursday, February 11, 2010													
	eastbound Ala Moana Blvd.			northbound Ward Avenue			westbound Ala Moana Blvd.			southbound Ward Avenue			total
	left turn	through	right turn	left turn	through	right turn	LT & UT	through	right turn	left turn	through	right turn	
6:30 AM - 6:45 AM	40	248	8	6	7	6	10	318	28	33	12	41	757
6:45 AM - 7:00 AM	55	305	0	3	4	3	12	304	9	21	16	35	767
7:00 AM - 7:15 AM	27	384	3	1	4	3	13	355	14	17	13	45	879
7:15 AM - 7:30 AM	66	400	0	2	6	5	22	464	20	22	28	64	1,099
7:30 AM - 7:45 AM	61	420	2	3	12	1	17	450	30	32	24	55	1,107
7:45 AM - 8:00 AM	71	441	1	3	7	4	18	412	21	22	29	45	1,074
8:00 AM - 8:15 AM	50	362	0	0	8	7	18	387	21	35	33	67	988
8:15 AM - 8:30 AM	65	385	1	1	11	2	25	373	28	36	22	58	1,007
count total	435	2,945	15	19	59	31	135	3,063	171	218	177	410	7,678
7:15 AM - 8:15 AM	248	1,623	3	8	33	17	75	1,713	92	111	114	231	4,268
3:30 PM - 3:45 PM	69	450	2	20	3	19	9	332	24	35	10	51	1,024
3:45 PM - 4:00 PM	81	549	2	21	1	14	5	432	25	54	9	58	1,251
4:00 PM - 4:15 PM	115	541	1	23	0	12	19	421	41	61	20	64	1,318
4:15 PM - 4:30 PM	78	455	3	10	0	20	11	346	50	46	11	59	1,089
4:30 PM - 4:45 PM	66	486	3	14	0	9	10	416	47	57	15	66	1,189
4:45 PM - 5:00 PM	65	503	4	21	2	11	10	381	51	54	29	80	1,211
5:00 PM - 5:15 PM	93	551	1	11	1	19	10	376	45	66	21	72	1,266
5:15 PM - 5:30 PM	77	545	4	17	2	14	5	279	34	45	10	57	1,089
5:30 PM - 5:45 PM	84	489	2	10	0	10	7	324	44	49	8	65	1,092
5:45 PM - 6:00 PM	66	444	1	12	0	14	8	358	45	41	14	73	1,076
6:00 PM - 6:15 PM	88	542	2	17	1	18	9	371	50	39	10	62	1,209
6:15 PM - 6:30 PM	93	549	2	14	1	18	15	308	45	38	7	51	1,141
count total	975	6,104	27	190	11	178	118	4,344	501	585	164	758	13,955
3:45 PM - 4:45 PM	340	2,031	9	68	1	55	45	1,615	163	218	55	247	4,847

manual counts, other locations (Wednesday, February 10, 2010 except as noted)													
	Driveway to Ahui St. (Thur., 2/11/2010)				Other driveways					Ala Moana Blvd & Kewalo Basin signal			total
	entering		exiting		enter at driveway near Ward Avenue				exit to EB AMB	AMB EB	NB (exiting)		
	right turn	left turn	left turn	right turn	from EB	from NB	from SB	from WB		right turn	left turn	right turn	
6:30 AM - 6:45 AM	0	2	0	0	4	0	1	0	1	12	4	3	19
6:45 AM - 7:00 AM	1	0	2	0	7	3	6	1	1	9	5	4	18
7:00 AM - 7:15 AM	0	0	0	0	12	1	5	2	0	9	0	0	9
7:15 AM - 7:30 AM	0	0	0	4	6	1	4	8	2	9	2	0	11
7:30 AM - 7:45 AM	2	2	0	1	12	1	5	8	2	12	10	10	32
7:45 AM - 8:00 AM	1	0	2	0	6	1	6	8	0	8	9	6	23
8:00 AM - 8:15 AM	0	1	1	2	9	1	6	13	1	11	8	10	29
8:15 AM - 8:30 AM	1	1	0	0	5	0	5	8	2	11	12	10	33
count total	5	6	5	7	61	8	38	48	9	81	50	43	174
7:30 AM - 8:30 AM	4	4	3	3	32	3	22	37	5	42	39	36	117
3:30 PM - 3:45 PM	0	0	1	6	9	3	7	1	1	12	11	28	51
3:45 PM - 4:00 PM	0	0	0	7	3	3	7	4	2	15	8	16	39
4:00 PM - 4:15 PM	0	0	0	4	6	1	4	5	3	15	6	11	32
4:15 PM - 4:30 PM	0	1	0	10	11	2	4	4	2	11	9	14	34
4:30 PM - 4:45 PM	2	2	0	7	5	2	6	10	3	7	14	10	31
4:45 PM - 5:00 PM	0	0	0	8	5	2	8	7	4	12	14	10	36
5:00 PM - 5:15 PM	1	2	2	7	1	0	3	6	0	12	10	11	33
5:15 PM - 5:30 PM	1	1	1	3	3	3	6	6	2	16	16	16	48
5:30 PM - 5:45 PM	1	1	0	4	3	2	2	2	0	18	12	10	40
5:45 PM - 6:00 PM	1	2	1	4	2	0	5	5	0	16	9	6	31
6:00 PM - 6:15 PM	2	0	0	2	5	0	4	4	5	41	19	19	79
6:15 PM - 6:30 PM	1	1	0	1	5	2	1	4	0	5	10	14	29
count total	9	10	5	63	58	20	57	58	22	180	138	165	483
5:15 PM - 6:15 PM	5	4	2	13	13	5	17	17	7	91	56	51	198

AMB = Ala Moana Boulevard   EB = eastbound   NB = northbound   SB = southbound   WB = westbound

Appendix B: Level of Service Calculations (12 pages)

Ala Moana Boulevard & Ward Avenue – 2010 AM Peak Hour

Ala Moana Boulevard & Ward Avenue – 2010 PM Peak Hour

Ala Moana Boulevard & Kewalo Basin – 2010 AM Peak Hour

Ala Moana Boulevard & Kewalo Basin – 2010 PM Peak Hour

Ala Moana Boulevard & Ward Avenue – 2012 PM Peak Hour (Base case)

Ala Moana Boulevard & Ward Avenue – 2012 PM Peak Hour (Base case)

Ala Moana Boulevard & Kewalo Basin – 2012 PM Peak Hour (Base case)

Ala Moana Boulevard & Kewalo Basin – 2012 PM Peak Hour (Base case)

Ala Moana Boulevard & Ward Avenue – 2012 AM Peak Hour plus project impact

Ala Moana Boulevard & Ward Avenue – 2012 PM Peak Hour plus project impact

Ala Moana Boulevard & Kewalo Basin – 2012 AM Peak Hour plus project impact

Ala Moana Boulevard & Kewalo Basin – 2012 PM Peak Hour plus project impact

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Ward Ave*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*3/18/2010*	Jurisdiction	*HDOT*
Time Period	*AM Peak Hour*	Analysis Year	*2010*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*1*	*3*	*0*	*1*	*3*	*1*	*0*	*2*	*1*	*1*	*1*	*1*
Lane group	*L*	*TR*		*L*	*T*	*R*		*LT*	*R*	*L*	*T*	*R*
Volume, V (vph)	*248*	*1623*	*3*	*75*	*1713*	*92*	*8*	*33*	*17*	*111*	*114*	*231*
% Heavy vehicles, %HV	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Peak-hour factor, PHF	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*
Pretimed (P) or actuated (A)	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*
Start-up lost time, l_1	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of effective green, e	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival type, AT	*3*	*3*		*3*	*3*	*3*		*3*	*3*	*3*	*3*	*3*
Unit extension, UE	*3.0*	*3.0*		*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Filtering/metering, I	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Initial unmet demand, Q_b	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Ped / Bike / RTOR volumes	*50*	*0*	*0*	*50*	*0*	*0*	*50*	*0*	*0*	*50*	*0*	*0*
Lane width	*11.0*	*12.0*		*11.0*	*11.0*	*11.0*		*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking maneuvers, N_m												
Buses stopping, N_B	*0*	*0*		*0*	*0*	*0*		*0*	*0*	*0*	*0*	*0*
Min. time for pedestrians, G_p	*3.7*			*3.7*			*3.7*			*3.7*		

Phasing	Excl. Left	EB Only	Thru & RT	04	SB Only	NB Only	07	08
Timing	G = *10.0*	G = *9.0*	G = *65.0*	G =	G = *17.0*	G = *12.0*	G =	G =
	Y = *5*	Y = *5*	Y = *6*	Y =	Y = *5*	Y = *6*	Y =	Y =
Duration of Analysis, T = *0.25*					Cycle Length, C = *140.0*			

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v	*258*	*1694*		*78*	*1784*	*96*		*42*	*18*	*116*	*119*	*241*
Lane group capacity, c	*288*	*2807*		*120*	*2234*	*913*		*295*	*110*	*211*	*222*	*399*
v/c ratio, X	*0.90*	*0.60*		*0.65*	*0.80*	*0.11*		*0.14*	*0.16*	*0.55*	*0.54*	*0.60*
Total green ratio, g/C	*0.17*	*0.56*		*0.07*	*0.46*	*0.63*		*0.09*	*0.09*	*0.12*	*0.12*	*0.29*
Uniform delay, d_1	*56.8*	*20.2*		*63.3*	*31.9*	*10.3*		*59.2*	*59.3*	*57.9*	*57.8*	*42.5*
Progression factor, PF	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Delay calibration, k	*0.50*	*0.50*		*0.50*	*0.50*	*0.11*		*0.50*	*0.50*	*0.50*	*0.50*	*0.50*
Incremental delay, d_2	*32.0*	*1.0*		*24.2*	*3.1*	*0.1*		*1.0*	*3.2*	*9.9*	*9.0*	*6.6*
Initial queue delay, d_3												
Control delay	*88.7*	*21.1*		*87.4*	*35.0*	*10.4*		*60.2*	*62.5*	*67.8*	*66.8*	*49.2*
Lane group LOS	*F*	*C*		*F*	*D*	*B*		*E*	*E*	*E*	*E*	*D*
Approach delay	*30.1*			*35.9*			*60.9*			*58.1*		
Approach LOS	*C*			*D*			*E*			*E*		
Intersection delay	*36.1*			X_c = *0.72*			Intersection LOS			*D*		

HCS2000™ DETAILED REPORT

General Information		Site Information	
Analyst	*JN*	Intersection	*AMB Ward Ave*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*3/18/2010*	Jurisdiction	*HDOT*
Time Period	*PM Peak Hour*	Analysis Year	*2010*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	1	3	0	1	3	1	0	2	1	1	1	1
Lane group	L	TR		L	T	R		LT	R	L	T	R
Volume, V (vph)	340	2031	9	45	1615	163	68	1	55	133	140	247
% Heavy vehicles, %HV	3	3	3	3	3	3	3	3	3	3	3	3
Peak-hour factor, PHF	0.95	0.92	0.84	0.92	0.93	0.90	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or actuated (A)	P	P	P	P	P	P	P	P	P	P	P	P
Start-up lost time, l_1	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Extension of effective green, e	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Arrival type, AT	3	3		3	3	3		3	3	3	3	3
Unit extension, UE	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Filtering/metering, I	1.000	1.000		1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Initial unmet demand, Q_b	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR volumes	50	0	0	50	0	0	50	0	0	50	0	0
Lane width	11.0	12.0		11.0	11.0	11.0		12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking maneuvers, N_m												
Buses stopping, N_B	0	0		0	0	0		0	0	0	0	0
Min. time for pedestrians, G_p	3.7			3.7			3.7			3.7		

Phasing	Excl. Left	EB Only	Thru & RT	04	SB Only	NB Only	07	08
Timing	G = 10.0	G = 19.0	G = 55.0	G =	G = 17.0	G = 12.0	G =	G =
	Y = 5	Y = 5	Y = 6	Y =	Y = 5	Y = 6	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 140.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v	358	2219		49	1737	181		75	60	145	152	268
Lane group capacity, c	411	2833		121	1908	812		287	111	213	224	501
v/c ratio, X	0.87	0.78		0.40	0.91	0.22		0.26	0.54	0.68	0.68	0.53
Total green ratio, g/C	0.24	0.56		0.07	0.39	0.56		0.09	0.09	0.12	0.12	0.36
Uniform delay, d_1	50.9	23.8		62.2	40.2	15.7		59.9	61.4	58.9	58.9	35.1
Progression factor, PF	1.000	1.000		1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Delay calibration, k	0.50	0.50		0.50	0.50	0.11		0.50	0.50	0.50	0.50	0.50
Incremental delay, d_2	21.6	2.2		9.8	8.0	0.1		2.2	17.6	16.2	15.3	4.1
Initial queue delay, d_3												
Control delay	72.5	26.1		71.9	48.2	15.8		62.1	78.9	75.1	74.2	39.2
Lane group LOS	E	C		E	D	B		E	E	E	E	D
Approach delay	32.5			45.8			69.6			57.8		
Approach LOS	C			D			E			E		
Intersection delay	41.2			X_c = 0.83			Intersection LOS			D		

HCS2000™ DETAILED REPORT

General Information		Site Information	
Analyst	*JN*	Intersection	*AMB Kewalo Basin*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*2/20/2010*	Jurisdiction	*HDOT*
Time Period	*AM Peak Hour*	Analysis Year	*2010*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*0*	*3*	*0*	*0*	*3*	*0*	*1*	*0*	*1*	*0*	*0*	*0*
Lane group		*TR*			*T*		*L*		*R*			
Volume, V (vph)		*1679*	*42*		*2031*		*39*		*36*			
% Heavy vehicles, %HV		*5*	*5*		*5*		*5*		*5*			
Peak-hour factor, PHF		*0.93*	*0.93*		*0.93*		*0.93*		*0.93*			
Pretimed (P) or actuated (A)		*P*	*P*		*P*		*P*		*P*			
Start-up lost time, l_1		*2.0*			*2.0*		*2.0*		*2.0*			
Extension of effective green, e		*2.0*			*2.0*		*2.0*		*2.0*			
Arrival type, AT		*3*			*3*		*3*		*3*			
Unit extension, UE		*3.0*			*3.0*		*3.0*		*3.0*			
Filtering/metering, I		*1.000*			*1.000*		*1.000*	*1.000*	*1.000*			
Initial unmet demand, Q_b		*0.0*			*0.0*		*0.0*		*0.0*			
Ped / Bike / RTOR volumes	*0*		*0*				*0*		*0*	*0*		
Lane width		*12.0*			*12.0*		*12.0*		*12.0*			
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*		*N*
Parking maneuvers, N_m												
Buses stopping, N_B		*0*			*0*		*0*		*0*			
Min. time for pedestrians, G_p		*3.2*						*3.2*			*3.2*	

Phasing	Thru & RT	02	03	04	NB Only	06	07	08
Timing	G = *110.0*	G =	G =	G =	G = *19.0*	G =	G =	G =
	Y = *6*	Y =	Y =	Y =	Y = *5*	Y =	Y =	Y =
Duration of Analysis, T = *0.25*						Cycle Length, C = *140.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v		*1850*			*2184*		*42*		*39*			
Lane group capacity, c		*3859*			*3873*		*233*		*209*			
v/c ratio, X		*0.48*			*0.56*		*0.18*		*0.19*			
Total green ratio, g/C		*0.79*			*0.79*		*0.14*		*0.14*			
Uniform delay, d_1		*5.2*			*5.8*		*53.6*		*53.6*			
Progression factor, PF		*1.000*			*1.000*		*1.000*		*1.000*			
Delay calibration, k		*0.50*			*0.50*		*0.50*		*0.50*			
Incremental delay, d_2		*0.4*			*0.6*		*1.7*		*2.0*			
Initial queue delay, d_3												
Control delay		*5.6*			*6.4*		*55.3*		*55.6*			
Lane group LOS		*A*			*A*		*E*		*E*			
Approach delay	*5.6*			*6.4*			*55.4*					
Approach LOS	*A*			*A*			*E*					
Intersection delay	*7.0*			X_c = *0.51*			Intersection LOS			*A*		

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Kewalo Basin*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*2/20/2010*	Jurisdiction	*HDOT*
Time Period	*PM Peak Hour*	Analysis Year	*2010*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*0*	*3*	*0*	*0*	*3*	*0*	*1*	*0*	*1*	*0*	*0*	*0*
Lane group		*TR*			*T*		*L*		*R*			
Volume, V (vph)		*2406*	*48*		*1682*		*37*		*51*			
% Heavy vehicles, %HV		*5*	*5*		*5*		*5*		*5*			
Peak-hour factor, PHF		*0.91*	*0.91*		*0.91*		*0.91*		*0.91*			
Pretimed (P) or actuated (A)		*P*	*P*		*P*		*P*		*P*			
Start-up lost time, l_1		*2.0*			*2.0*		*2.0*		*2.0*			
Extension of effective green, e		*2.0*			*2.0*		*2.0*		*2.0*			
Arrival type, AT		*3*			*3*		*3*		*3*			
Unit extension, UE		*3.0*			*3.0*		*3.0*		*3.0*			
Filtering/metering, I		*1.000*			*1.000*		*1.000*	*1.000*	*1.000*			
Initial unmet demand, Q_b		*0.0*			*0.0*		*0.0*		*0.0*			
Ped / Bike / RTOR volumes	*0*		*0*				*0*		*0*	*0*		
Lane width		*12.0*			*12.0*		*12.0*		*12.0*			
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*		*N*
Parking maneuvers, N_m												
Buses stopping, N_B		*0*			*0*		*0*		*0*			
Min. time for pedestrians, G_p	*3.2*						*3.2*			*3.2*		

Phasing	Thru & RT	02	03	04	NB Only	06	07	08
Timing	G = *110.0*	G =	G =	G =	G = *19.0*	G =	G =	G =
	Y = *6*	Y =	Y =	Y =	Y = *5*	Y =	Y =	Y =
Duration of Analysis, T = *0.25*						Cycle Length, C = *140.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v		*2697*			*1848*		*41*		*56*			
Lane group capacity, c		*3862*			*3873*		*233*		*209*			
v/c ratio, X		*0.70*			*0.48*		*0.18*		*0.27*			
Total green ratio, g/C		*0.79*			*0.79*		*0.14*		*0.14*			
Uniform delay, d_1		*7.1*			*5.1*		*53.6*		*54.3*			
Progression factor, PF		*1.000*			*1.000*		*1.000*		*1.000*			
Delay calibration, k		*0.50*			*0.50*		*0.50*		*0.50*			
Incremental delay, d_2		*1.1*			*0.4*		*1.6*		*3.1*			
Initial queue delay, d_3												
Control delay		*8.2*			*5.6*		*55.2*		*57.4*			
Lane group LOS		*A*			*A*		*E*		*E*			
Approach delay	*8.2*			*5.6*			*56.5*					
Approach LOS	*A*			*A*			*E*					
Intersection delay	*8.2*			X_c = *0.64*			Intersection LOS			*A*		

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Ward Ave*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*AM Peak Hour*	Analysis Year	*2012 base*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*1*	*3*	*0*	*1*	*3*	*1*	*0*	*2*	*1*	*1*	*1*	*1*
Lane group	*L*	*TR*		*L*	*T*	*R*		*LT*	*R*	*L*	*T*	*R*
Volume, V (vph)	*271*	*1735*	*4*	*85*	*1826*	*94*	*9*	*36*	*19*	*116*	*118*	*272*
% Heavy vehicles, %HV	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Peak-hour factor, PHF	*0.95*	*0.92*	*0.84*	*0.92*	*0.93*	*0.90*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Pretimed (P) or actuated (A)	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*
Start-up lost time, l_1	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of effective green, e	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival type, AT	*3*	*3*		*3*	*3*	*3*		*3*	*3*	*3*	*3*	*3*
Unit extension, UE	*3.0*	*3.0*		*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Filtering/metering, I	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Initial unmet demand, Q_b	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Ped / Bike / RTOR volumes	*50*	*0*	*0*	*50*	*0*	*0*	*50*	*0*	*0*	*50*	*0*	*0*
Lane width	*11.0*	*12.0*		*11.0*	*11.0*	*11.0*		*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking maneuvers, N_m												
Buses stopping, N_B	*0*	*0*		*0*	*0*	*0*		*0*	*0*	*0*	*0*	*0*
Min. time for pedestrians, G_p		*3.7*			*3.7*			*3.7*			*3.7*	

Phasing	Excl. Left	EB Only	Thru & RT	04	SB Only	NB Only	07	08
Timing	G = *10.0*	G = *9.0*	G = *65.0*	G =	G = *17.0*	G = *12.0*	G =	G =
	Y = *5*	Y = *5*	Y = *6*	Y =	Y = *5*	Y = *6*	Y =	Y =
Duration of Analysis, T = *0.25*						Cycle Length, C = *140.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v	*285*	*1891*		*92*	*1963*	*104*		*49*	*21*	*126*	*128*	*296*
Lane group capacity, c	*290*	*2834*		*121*	*2255*	*922*		*298*	*111*	*213*	*224*	*403*
v/c ratio, X	*0.98*	*0.67*		*0.76*	*0.87*	*0.11*		*0.16*	*0.19*	*0.59*	*0.57*	*0.73*
Total green ratio, g/C	*0.17*	*0.56*		*0.07*	*0.46*	*0.63*		*0.09*	*0.09*	*0.12*	*0.12*	*0.29*
Uniform delay, d_1	*57.8*	*21.3*		*63.8*	*33.7*	*10.4*		*59.4*	*59.5*	*58.2*	*58.1*	*44.6*
Progression factor, PF	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Delay calibration, k	*0.50*	*0.50*		*0.50*	*0.50*	*0.11*		*0.50*	*0.50*	*0.50*	*0.50*	*0.50*
Incremental delay, d_2	*48.7*	*1.3*		*35.5*	*4.9*	*0.1*		*1.2*	*3.7*	*11.5*	*10.2*	*11.3*
Initial queue delay, d_3												
Control delay	*106.5*	*22.6*		*99.3*	*38.7*	*10.4*		*60.5*	*63.2*	*69.7*	*68.2*	*55.9*
Lane group LOS	*F*	*C*		*F*	*D*	*B*		*E*	*E*	*E*	*E*	*E*
Approach delay	*33.6*			*39.9*			*61.3*			*61.9*		
Approach LOS	*C*			*D*			*E*			*E*		
Intersection delay	*39.9*			X_c = *0.78*			Intersection LOS			*D*		

HCS2000™ DETAILED REPORT

General Information		Site Information	
Analyst	*JN*	Intersection	*AMB Ward Ave*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*PM Peak Hour*	Analysis Year	*2012 Base*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	1	3	0	1	3	1	0	2	1	1	1	1
Lane group	L	TR		L	T	R		LT	R	L	T	R
Volume, V (vph)	379	2204	14	51	1744	172	94	1	64	141	144	280
% Heavy vehicles, %HV	3	3	3	3	3	3	3	3	3	3	3	3
Peak-hour factor, PHF	0.95	0.92	0.84	0.92	0.93	0.90	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or actuated (A)	P	P	P	P	P	P	P	P	P	P	P	P
Start-up lost time, l_1	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Extension of effective green, e	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Arrival type, AT	3	3		3	3	3		3	3	3	3	3
Unit extension, UE	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Filtering/metering, I	1.000	1.000		1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Initial unmet demand, Q_b	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR volumes	50	0	0	50	0	0	50	0	0	50	0	0
Lane width	11.0	12.0		11.0	11.0	11.0		12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking maneuvers, N_m												
Buses stopping, N_B	0	0		0	0	0		0	0	0	0	0
Min. time for pedestrians, G_p	3.7			3.7			3.7			3.7		

Phasing	Excl. Left	EB Only	Thru & RT	04	SB Only	NB Only	07	08
Timing	G = 10.0	G = 19.0	G = 55.0	G =	G = 17.0	G = 12.0	G =	G =
	Y = 5	Y = 5	Y = 6	Y =	Y = 5	Y = 6	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 140.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v	399	2413		55	1875	191		103	70	153	157	304
Lane group capacity, c	411	2832		121	1908	812		287	111	213	224	501
v/c ratio, X	0.97	0.85		0.45	0.98	0.24		0.36	0.63	0.72	0.70	0.61
Total green ratio, g/C	0.24	0.56		0.07	0.39	0.56		0.09	0.09	0.12	0.12	0.36
Uniform delay, d_1	52.5	25.6		62.4	42.0	15.8		60.4	61.9	59.2	59.1	36.3
Progression factor, PF	1.000	1.000		1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Delay calibration, k	0.50	0.50		0.50	0.50	0.11		0.50	0.50	0.50	0.50	0.50
Incremental delay, d_2	37.7	3.5		11.8	16.9	0.1		3.5	24.2	18.8	16.7	5.4
Initial queue delay, d_3												
Control delay	90.2	29.1		74.2	58.9	15.9		63.8	86.0	78.0	75.8	41.7
Lane group LOS	F	C		E	E	B		E	F	E	E	D
Approach delay	37.7			55.5			72.8			59.5		
Approach LOS	D			E			E			E		
Intersection delay	47.7			X_c = 0.91			Intersection LOS			D		

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Kewalo Basin*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*AM Peak Hour*	Analysis Year	*2012 Base*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*0*	*3*	*0*	*0*	*3*	*0*	*1*	*0*	*1*	*0*	*0*	*0*
Lane group		*TR*			*T*		*L*		*R*			
Volume, V (vph)		*1806*	*43*		*2180*		*40*		*37*			
% Heavy vehicles, %HV		*5*	*5*		*5*		*5*		*5*			
Peak-hour factor, PHF		*0.93*	*0.93*		*0.93*		*0.93*		*0.93*			
Pretimed (P) or actuated (A)		*P*	*P*		*P*		*P*		*P*			
Start-up lost time, l_1		*2.0*			*2.0*		*2.0*		*2.0*			
Extension of effective green, e		*2.0*			*2.0*		*2.0*		*2.0*			
Arrival type, AT		*3*			*3*		*3*		*3*			
Unit extension, UE		*3.0*			*3.0*		*3.0*		*3.0*			
Filtering/metering, I		*1.000*			*1.000*		*1.000*	*1.000*	*1.000*			
Initial unmet demand, Q_b		*0.0*			*0.0*		*0.0*		*0.0*			
Ped / Bike / RTOR volumes	*0*		*0*				*50*		*0*	*0*		
Lane width		*12.0*			*12.0*		*12.0*		*12.0*			
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*		*N*
Parking maneuvers, N_m												
Buses stopping, N_B		*0*			*0*		*0*		*0*			
Min. time for pedestrians, G_p		*3.2*						*3.7*			*3.2*	

Phasing	Thru & RT	02	03	04	NB Only	06	07	08
Timing	G = *110.0*	G =	G =	G =	G = *19.0*	G =	G =	G =
	Y = *6*	Y =	Y =	Y =	Y = *5*	Y =	Y =	Y =
Duration of Analysis, T = *0.25*						Cycle Length, C = *140.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v		*1988*			*2344*		*43*		*40*			
Lane group capacity, c		*3859*			*3873*		*233*		*209*			
v/c ratio, X		*0.52*			*0.61*		*0.18*		*0.19*			
Total green ratio, g/C		*0.79*			*0.79*		*0.14*		*0.14*			
Uniform delay, d_1		*5.4*			*6.1*		*53.6*		*53.7*			
Progression factor, PF		*1.000*			*1.000*		*1.000*		*1.000*			
Delay calibration, k		*0.50*			*0.50*		*0.50*		*0.50*			
Incremental delay, d_2		*0.5*			*0.7*		*1.7*		*2.0*			
Initial queue delay, d_3												
Control delay		*5.9*			*6.8*		*55.4*		*55.7*			
Lane group LOS		*A*			*A*		*E*		*E*			
Approach delay	*5.9*			*6.8*			*55.5*					
Approach LOS	*A*			*A*			*E*					
Intersection delay	*7.3*			X_c = *0.54*			Intersection LOS			*A*		

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Kewalo Basin*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*PM Peak Hour*	Analysis Year	*2012 base*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*0*	*3*	*0*	*0*	*3*	*0*	*1*	*0*	*1*	*0*	*0*	*0*
Lane group		*TR*			*T*		*L*		*R*			
Volume, V (vph)		*2628*	*50*		*1835*		*38*		*52*			
% Heavy vehicles, %HV		*5*	*5*		*5*		*5*		*5*			
Peak-hour factor, PHF		*0.91*	*0.91*		*0.91*		*0.91*		*0.91*			
Pretimed (P) or actuated (A)		*P*	*P*		*P*		*P*		*P*			
Start-up lost time, l_1		*2.0*			*2.0*		*2.0*		*2.0*			
Extension of effective green, e		*2.0*			*2.0*		*2.0*		*2.0*			
Arrival type, AT		*3*			*3*		*3*		*3*			
Unit extension, UE		*3.0*			*3.0*		*3.0*		*3.0*			
Filtering/metering, I		*1.000*			*1.000*		*1.000*	*1.000*	*1.000*			
Initial unmet demand, Q_b		*0.0*			*0.0*		*0.0*		*0.0*			
Ped / Bike / RTOR volumes	*0*		*0*				*0*		*0*	*0*		
Lane width		*12.0*			*12.0*		*12.0*		*12.0*			
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*		*N*
Parking maneuvers, N_m												
Buses stopping, N_B		*0*			*0*		*0*		*0*			
Min. time for pedestrians, G_p		*3.2*						*3.2*			*3.2*	

Phasing	Thru & RT	02	03	04	NB Only	06	07	08
Timing	G = *110.0*	G =	G =	G =	G = *19.0*	G =	G =	G =
	Y = *6*	Y =	Y =	Y =	Y = *5*	Y =	Y =	Y =
Duration of Analysis, T = *0.25*						Cycle Length, C = *140.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v		*2943*			*2016*		*42*		*57*			
Lane group capacity, c		*3862*			*3873*		*233*		*209*			
v/c ratio, X		*0.76*			*0.52*		*0.18*		*0.27*			
Total green ratio, g/C		*0.79*			*0.79*		*0.14*		*0.14*			
Uniform delay, d_1		*8.0*			*5.4*		*53.6*		*54.3*			
Progression factor, PF		*1.000*			*1.000*		*1.000*		*1.000*			
Delay calibration, k		*0.50*			*0.50*		*0.50*		*0.50*			
Incremental delay, d_2		*1.5*			*0.5*		*1.7*		*3.2*			
Initial queue delay, d_3												
Control delay		*9.5*			*5.9*		*55.3*		*57.5*			
Lane group LOS		*A*			*A*		*E*		*E*			
Approach delay		*9.5*			*5.9*			*56.6*				
Approach LOS		*A*			*A*			*E*				
Intersection delay		*9.0*			X_c = *0.69*		Intersection LOS				*A*	

HCS2000™ DETAILED REPORT

General Information		Site Information	
Analyst	*JN*	Intersection	*AMB Ward Ave*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*AM Peak Hour*	Analysis Year	*2012 plus project*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	1	3	0	1	3	1	0	2	1	1	1	1
Lane group	L	TR		L	T	R		LT	R	L	T	R
Volume, V (vph)	271	1738	4	87	1827	95	9	36	20	118	118	272
% Heavy vehicles, %HV	3	3	3	3	3	3	3	3	3	3	3	3
Peak-hour factor, PHF	0.95	0.92	0.84	0.92	0.93	0.90	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or actuated (A)	P	P	P	P	P	P	P	P	P	P	P	P
Start-up lost time, l_1	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Extension of effective green, e	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Arrival type, AT	3	3		3	3	3		3	3	3	3	3
Unit extension, UE	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
Filtering/metering, I	1.000	1.000		1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Initial unmet demand, Q_b	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR volumes	50	0	0	50	0	0	50	0	0	50	0	0
Lane width	11.0	12.0		11.0	11.0	11.0		12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking maneuvers, N_m												
Buses stopping, N_B	0	0		0	0	0		0	0	0	0	0
Min. time for pedestrians, G_p	3.7			3.7			3.7			3.7		

Phasing	Excl. Left	EB Only	Thru & RT	04	SB Only	NB Only	07	08
Timing	G = 10.0	G = 9.0	G = 65.0	G =	G = 17.0	G = 12.0	G =	G =
	Y = 5	Y = 5	Y = 6	Y =	Y = 5	Y = 6	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 140.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v	285	1894		95	1965	106		49	22	128	128	296
Lane group capacity, c	290	2834		121	2255	922		298	111	213	224	403
v/c ratio, X	0.98	0.67		0.79	0.87	0.11		0.16	0.20	0.60	0.57	0.73
Total green ratio, g/C	0.17	0.56		0.07	0.46	0.63		0.09	0.09	0.12	0.12	0.29
Uniform delay, d_1	57.8	21.3		63.9	33.7	10.4		59.4	59.5	58.3	58.1	44.6
Progression factor, PF	1.000	1.000		1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Delay calibration, k	0.50	0.50		0.50	0.50	0.11		0.50	0.50	0.50	0.50	0.50
Incremental delay, d_2	48.7	1.3		38.8	5.0	0.1		1.2	4.0	11.9	10.2	11.3
Initial queue delay, d_3												
Control delay	106.5	22.6		102.7	38.7	10.5		60.5	63.5	70.2	68.2	55.9
Lane group LOS	F	C		F	D	B		E	E	E	E	E
Approach delay	33.6			40.1			61.5			62.1		
Approach LOS	C			D			E			E		
Intersection delay	40.0			X_c = 0.79			Intersection LOS			D		

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Ward Ave*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*PM Peak Hour*	Analysis Year	*2012 plus project*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	*1*	*3*	*0*	*1*	*3*	*1*	*0*	*2*	*1*	*1*	*1*	*1*
Lane group	*L*	*TR*		*L*	*T*	*R*		*LT*	*R*	*L*	*T*	*R*
Volume, V (vph)	*379*	*2207*	*14*	*52*	*1745*	*173*	*94*	*1*	*65*	*144*	*144*	*280*
% Heavy vehicles, %HV	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Peak-hour factor, PHF	*0.95*	*0.92*	*0.84*	*0.92*	*0.93*	*0.90*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Pretimed (P) or actuated (A)	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*	*P*
Start-up lost time, l_1	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Extension of effective green, e	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival type, AT	*3*	*3*		*3*	*3*	*3*		*3*	*3*	*3*	*3*	*3*
Unit extension, UE	*3.0*	*3.0*		*3.0*	*3.0*	*3.0*		*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Filtering/metering, I	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Initial unmet demand, Q_b	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Ped / Bike / RTOR volumes	*50*	*0*	*0*	*50*	*0*	*0*	*50*	*0*	*0*	*50*	*0*	*0*
Lane width	*11.0*	*12.0*		*11.0*	*11.0*	*11.0*		*12.0*	*12.0*	*12.0*	*12.0*	*12.0*
Parking / Grade / Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking maneuvers, N_m												
Buses stopping, N_B	*0*	*0*		*0*	*0*	*0*		*0*	*0*	*0*	*0*	*0*
Min. time for pedestrians, G_p	*3.7*			*3.7*			*3.7*			*3.7*		

Phasing	Excl. Left	EB Only	Thru & RT	04	SB Only	NB Only	07	08
Timing	G = *10.0*	G = *19.0*	G = *55.0*	G =	G = *17.0*	G = *12.0*	G =	G =
	Y = *5*	Y = *5*	Y = *6*	Y =	Y = *5*	Y = *6*	Y =	Y =
Duration of Analysis, T = *0.25*						Cycle Length, C = *140.0*		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v	*399*	*2416*		*57*	*1876*	*192*		*103*	*71*	*157*	*157*	*304*
Lane group capacity, c	*411*	*2832*		*121*	*1908*	*812*		*287*	*111*	*213*	*224*	*501*
v/c ratio, X	*0.97*	*0.85*		*0.47*	*0.98*	*0.24*		*0.36*	*0.64*	*0.74*	*0.70*	*0.61*
Total green ratio, g/C	*0.24*	*0.56*		*0.07*	*0.39*	*0.56*		*0.09*	*0.09*	*0.12*	*0.12*	*0.36*
Uniform delay, d_1	*52.5*	*25.6*		*62.5*	*42.0*	*15.8*		*60.4*	*61.9*	*59.3*	*59.1*	*36.3*
Progression factor, PF	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*		*1.000*	*1.000*	*1.000*	*1.000*	*1.000*
Delay calibration, k	*0.50*	*0.50*		*0.50*	*0.50*	*0.11*		*0.50*	*0.50*	*0.50*	*0.50*	*0.50*
Incremental delay, d_2	*37.7*	*3.5*		*12.6*	*17.0*	*0.2*		*3.5*	*24.9*	*20.2*	*16.7*	*5.4*
Initial queue delay, d_3												
Control delay	*90.2*	*29.1*		*75.0*	*59.0*	*16.0*		*63.8*	*86.9*	*79.6*	*75.8*	*41.7*
Lane group LOS	*F*	*C*		*E*	*E*	*B*		*E*	*F*	*E*	*E*	*D*
Approach delay	*37.8*			*55.6*			*73.2*			*60.0*		
Approach LOS	*D*			*E*			*E*			*E*		
Intersection delay	*47.9*			X_c = *0.91*			Intersection LOS			*D*		

HCS2000™ DETAILED REPORT

General Information		***Site Information***	
Analyst	*JN*	Intersection	*AMB Kewalo Basin*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*AM Peak Hour*	Analysis Year	*2012 plus project*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	0	3	0	0	3	0	1	0	1	0	0	0
Lane group		TR			T		L		R			
Volume, V (vph)		1807	45		2182		42		39			
% Heavy vehicles, %HV		5	5		5		5		5			
Peak-hour factor, PHF		0.93	0.93		0.93		0.93		0.93			
Pretimed (P) or actuated (A)		P	P		P		P		P			
Start-up lost time, l_1		2.0			2.0		2.0		2.0			
Extension of effective green, e		2.0			2.0		2.0		2.0			
Arrival type, AT		3			3		3		3			
Unit extension, UE		3.0			3.0		3.0		3.0			
Filtering/metering, I		1.000			1.000		1.000	1.000	1.000			
Initial unmet demand, Q_b		0.0			0.0		0.0		0.0			
Ped / Bike / RTOR volumes	0		0				50		0	0		
Lane width		12.0			12.0		12.0		12.0			
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N		N
Parking maneuvers, N_m												
Buses stopping, N_B		0			0		0		0			
Min. time for pedestrians, G_p		3.2						3.7			3.2	

Phasing	Thru & RT	02	03	04	NB Only	06	07	08
Timing	G = 110.0	G =	G =	G =	G = 19.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 5	Y =	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 140.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v		1991			2346		45		42			
Lane group capacity, c		3859			3873		233		209			
v/c ratio, X		0.52			0.61		0.19		0.20			
Total green ratio, g/C		0.79			0.79		0.14		0.14			
Uniform delay, d_1		5.4			6.1		53.7		53.8			
Progression factor, PF		1.000			1.000		1.000		1.000			
Delay calibration, k		0.50			0.50		0.50		0.50			
Incremental delay, d_2		0.5			0.7		1.8		2.2			
Initial queue delay, d_3												
Control delay		5.9			6.8		55.5		55.9			
Lane group LOS		A			A		E		E			
Approach delay	5.9			6.8			55.7					
Approach LOS	A			A			E					
Intersection delay	7.4			X_c = 0.55			Intersection LOS			A		

HCS2000™ DETAILED REPORT

General Information		**Site Information**	
Analyst	*JN*	Intersection	*AMB Kewalo Basin*
Agency or Co.	*Julian Ng Inc.*	Area Type	*All other areas*
Date Performed	*8/13/2010*	Jurisdiction	*HDOT*
Time Period	*PM Peak Hour*	Analysis Year	*2012 + project*
		Project ID	*Kewalo Basin*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N_1	0	3	0	0	3	0	1	0	1	0	0	0
Lane group		TR			T		L		R			
Volume, V (vph)		2629	55		1836		41		55			
% Heavy vehicles, %HV		5	5		5		5		5			
Peak-hour factor, PHF		0.91	0.91		0.91		0.91		0.91			
Pretimed (P) or actuated (A)		P	P		P		P		P			
Start-up lost time, l_1		2.0			2.0		2.0		2.0			
Extension of effective green, e		2.0			2.0		2.0		2.0			
Arrival type, AT		3			3		3		3			
Unit extension, UE		3.0			3.0		3.0		3.0			
Filtering/metering, I		1.000			1.000		1.000	1.000	1.000			
Initial unmet demand, Q_b		0.0			0.0		0.0		0.0			
Ped / Bike / RTOR volumes	0		0				0		0	0		
Lane width		12.0			12.0		12.0		12.0			
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N		N
Parking maneuvers, N_m												
Buses stopping, N_B		0			0		0		0			
Min. time for pedestrians, G_p		3.2						3.2			3.2	

Phasing	Thru & RT	02	03	04	NB Only	06	07	08
Timing	G = 110.0	G =	G =	G =	G = 19.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 5	Y =	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 140.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted flow rate, v		2949			2018		45		60			
Lane group capacity, c		3861			3873		233		209			
v/c ratio, X		0.76			0.52		0.19		0.29			
Total green ratio, g/C		0.79			0.79		0.14		0.14			
Uniform delay, d_1		8.0			5.4		53.7		54.4			
Progression factor, PF		1.000			1.000		1.000		1.000			
Delay calibration, k		0.50			0.50		0.50		0.50			
Incremental delay, d_2		1.5			0.5		1.8		3.4			
Initial queue delay, d_3												
Control delay		9.5			5.9		55.5		57.8			
Lane group LOS		A			A		E		E			
Approach delay	9.5			5.9			56.9					
Approach LOS	A			A			E					
Intersection delay	9.1			X_c = 0.69			Intersection LOS			A		

Cover photo courtesy of Almar Management

F
Archaeological Literature Review and Field Inspection

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

June 8, 2010

Dr. Hallet Hammatt
Cultural Surveys Hawaii
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2010.2065
DOC NO: 1006MV20
Archaeology

Dear Dr. Hammatt:

SUBJECT: HAR § 13-13-276 Review –
Kewalo Basin Repairs Project Archaeological Literature Review and Field Inspection Report, Kaka'ako Ahupua'a, Honolulu (Kona District), Oahu
TMK: [1] 2-1-058

Thank you for the opportunity to review this archaeological literature review and field inspection report that was received by our office on May 20, 2010. Old maps and aerial photos provided in this document indicate that the land area around Kewalo Basin was constructed from dredging spoils in the 1950's. Therefore, it makes sense that there are no identifiable archaeological resources within the Kewalo Basin project area (bounded by TMK plat 2-1-058). While it appears that this area was entirely constructed of fill, we agree with your recommendation that SHPD should be consulted prior to any substantial ground disturbing activities within 10m to the south of the south curb of Ala Moana blvd., as this may be the only portion of the property that has subsurface native soils.

In addition, the background research for this document provided an excellent description of the land use history for the Kewalo Area. The literature review recognized an area of potential significance in Hawaiian history, with the association of Kewalo Basin with the Sampan Aku fisheries industry of the early 1900's. This association may qualify Kewalo Basin as a historic site based on its association with history (Criteria "A") and the association with cultural practices that were once carried out or still carried out at the property (Criteria "E"). This is something to consider for future planning and consultation purposes.

This document will be a valuable resource for the SHPD library. Please resubmit a copy of this report, marked "**FINAL,**" along with a copy of this review letter and a text-searchable PDF version on CD to the attention of the "**SHPD Library**" at the Kapolei SHPD office.

Please call Mike Vitousek at (808) 692-8029 if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager

Final
Kewalo Basin Repairs Project
Archaeological Literature Review
And Field Inspection Report
Kaka‘ako Ahupua‘a, Honolulu (Kona District), O‘ahu
TMK: [1] 2-1-058

Prepared for

Helber Hastert and Fee Planners

Prepared by

Hallett H. Hammatt, Ph.D.

And

David W. Shideler M.A.

Cultural Surveys Hawai‘i, Inc.

Kailua, Hawai‘i

(Job Code: KAKAAKO 24)

May 2010

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Management Summary

Reference	Kewalo Basin Repairs Project Archaeological Literature Review and Field Inspection Report Kaka‘ako Ahupua‘a, Honolulu (Kona District), O‘ahu TMK: [1] 2-1-058 (Hammatt and Shideler 2010)
Date	May 2010
Project Number (s)	Cultural Surveys Hawai‘i (CSH) project job code KAKAAKO 24
Investigation Permit Number	CSH is presently carrying out archaeological studies under State Historic Preservation Division permit 10-10
Project Location	The study area is Kewalo Basin and immediately adjacent lands located in central, coastal Honolulu on the central/east portion of the south shore of O‘ahu. In general terms the study area conforms to Tax Map Key (TMK) plat 2-1-058 and is bounded on the *mauka* or north side by the *makai* or south side of Ala Moana Boulevard and lies west of the west side of Ala Moana Beach Park extending to the west as far as Ahui Street.
Land Jurisdiction	All of the project area is administered by the Hawai‘i Community Development Authority (HCDA)
Agencies	This study was prepared to facilitate planning and possibly consultation with the State Historic Preservation Division
Historic Properties Identified	No historic properties were identified within the project area or are believed to be present
Recommendations	A significant focus of this study was a good-faith effort to determine whether any native soils are present above the water table anywhere in the project area. It appears at least 95% of the study area is twentieth century fill. Some question remains whether there may be potentially cultural deposit bearing soils within 10 m seaward of the seaward curb of Ala Moana Blvd. Consultation with the State Historic Preservation Division is recommended prior to any substantial ground disturbing activities within 10 m to the south of the south curb of Ala Moana Boulevard. The presence of two contemporary statues, a Native Hawaiian garden, a charter school seemingly dedicated to Native Hawaiian arts, and a unique form of naval architecture in the *aku* sampans of a formerly vibrant skipjack tuna fishery are noted within the study area. We understand that provision for commercial fishing slips will continue allowing for the possible continuation of this important part of the historic and cultural fabric and legacy of Kewalo Basin.

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List of Figures

Section 1 Introduction

1.1 Project Background

Cultural Surveys Hawai'i was hired by Helber Hastert and Fee, Planners to prepare a summary report on the cultural anthropology and archaeology of the Kewalo Basin area, Kaka'ako Ahupua'a, Honolulu (Kona District), O'ahu Island (TMK plat: [1] 2-1-058: various parcels). The vast majority of the study area lands were shallow coral reefs under water at high tide until land fill efforts of the early twentieth century.

The purpose of the present study is understood to be primarily documentation of the history of land use with an evaluation for the potential for cultural resources within the study area. The present study is not intended to fulfill standard SHPD requirements for Archaeological Inventory Surveys but is intended for planning and consultation purposes. A part of the purpose of this study was documentation of the quite recent history of land creation, it may be that no, or minimal, further cultural resource management study may be appropriate for some or all portions of the lands addressed.

The study area is located in central, coastal Honolulu on the central/east portion of the south shore of O'ahu. In general terms the study area is bounded on the *mauka* or north side by the *makai* or south side of Ala Moana Boulevard and lies west of the west side of Ala Moana Beach Park extending to the west to Ahui Street (Figure 1 U.S. Geological Survey quad map, Figure 2 Tax Map Key [1] 2-1-058 plat map and Figure 3 aerial photograph). Major landmarks in this study area include Kewalo Basin (and the associated National Marine Fisheries Service facilities), the Fisherman's Wharf Restaurant, and the John Dominis Restaurant.

1.2 Scope of Work

The scope of Work for this study includes:

- Synthesis of historical research to include study of archival sources, historic maps, Land Commission Awards and previous archaeological reports to construct a history of land use and to determine if archaeological sites have been recorded in or near the area, and
- Preparation of a report to include the results of the historical research

1.3 Environmental Setting

1.3.1 Natural Environment

Virtually the entire study area lies on relatively recently created land. Soil maps indicate that all of the land is "Fill Land Mixed" ("FL"; Figure 4) or water (Foote et al. 1972). This area is dominated by parking lots, asphalt roads, and Kewalo Basin itself. Kewalo Basin is one of the major commercial boat harbors of Honolulu.

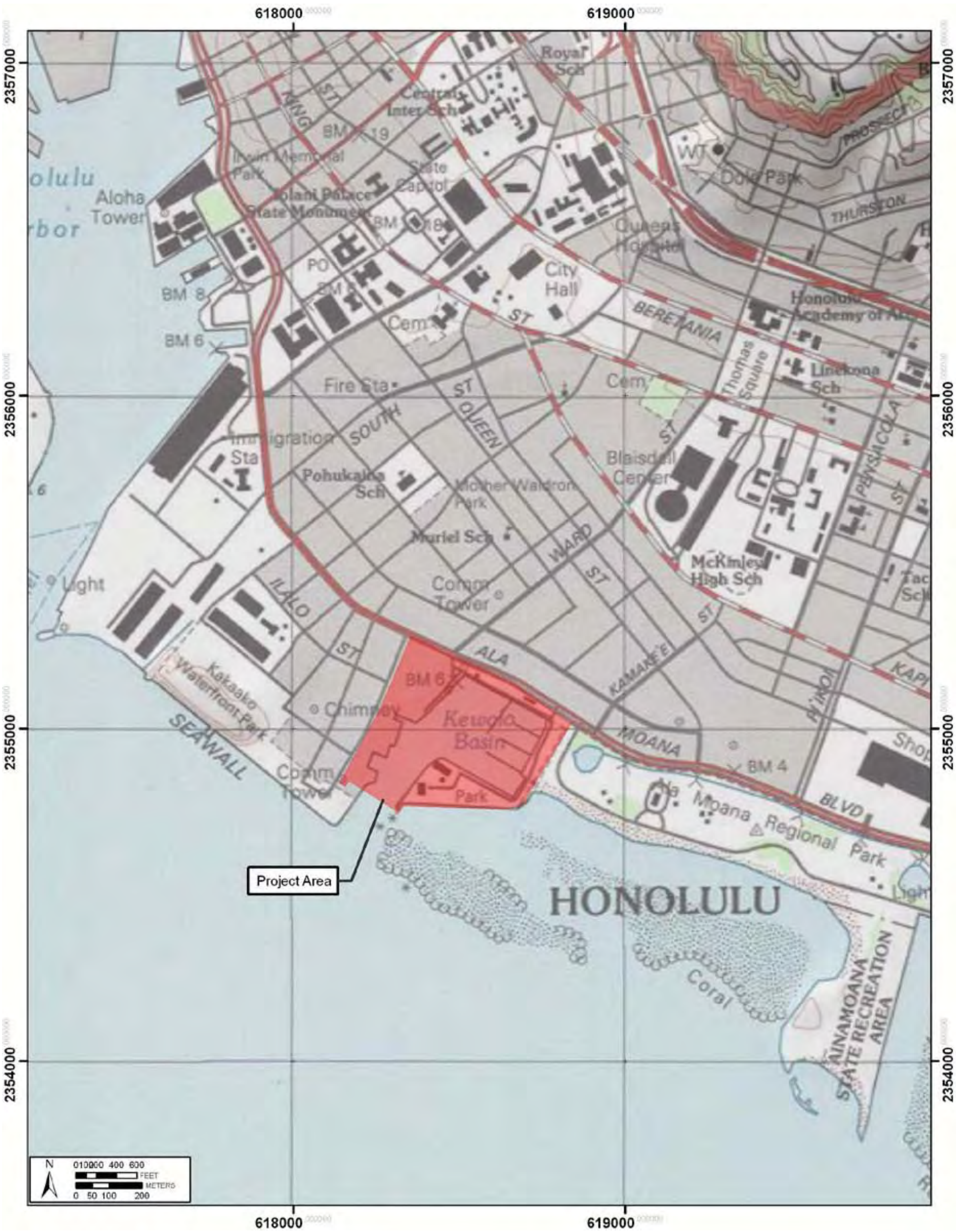

Figure 1. Portion of U.S. Geological Survey 7.5 Minute Series Topographical Map, Honolulu Quadrangle 1998, showing location of study area

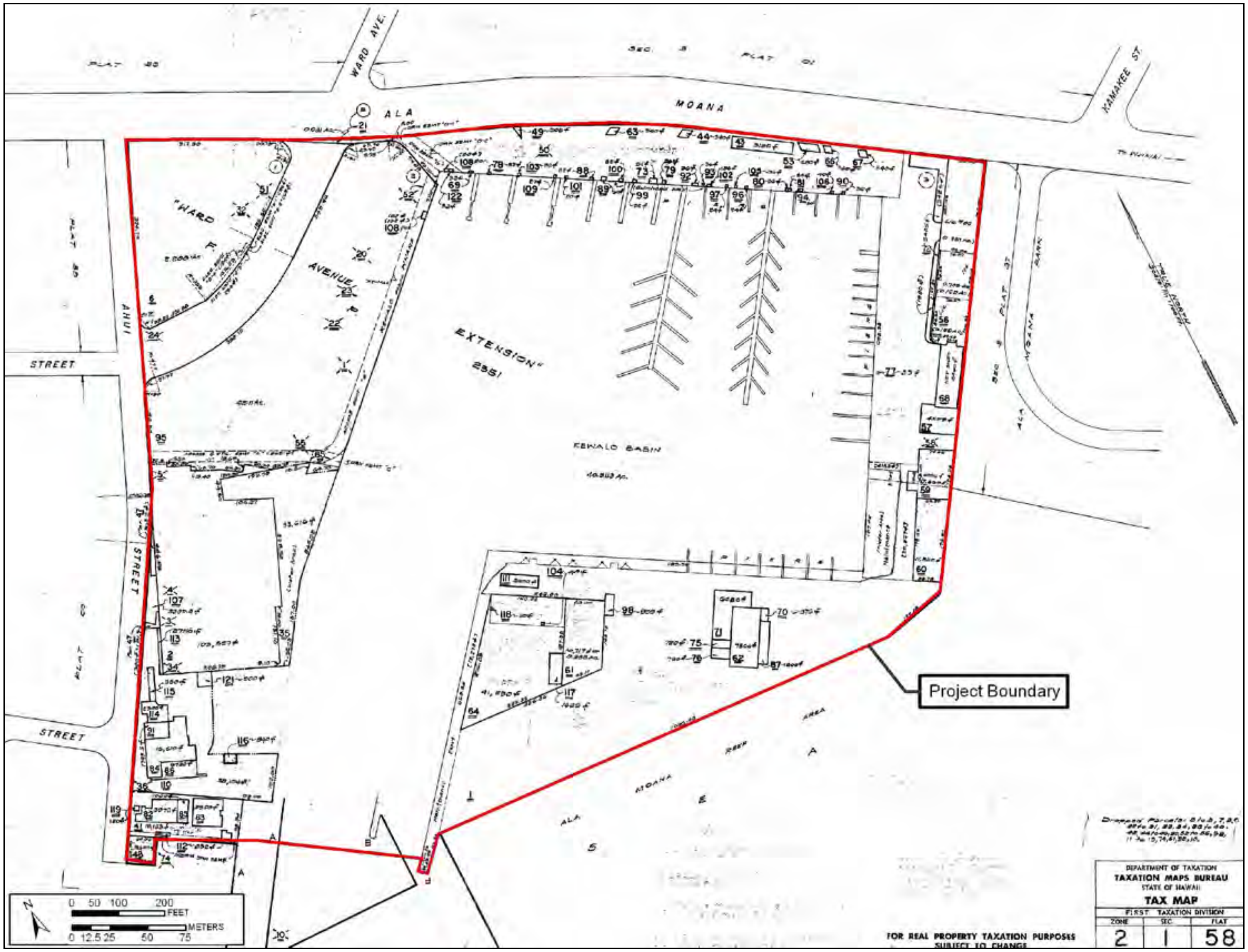

Figure 2. Hawai‘i Tax Map Zone 2 Section 1 Plat 58, map showing study area (Hawai‘i TMK Service)

Figure 3. Aerial Photograph showing study area (U.S. Geological Survey Orthoimagery 2005)

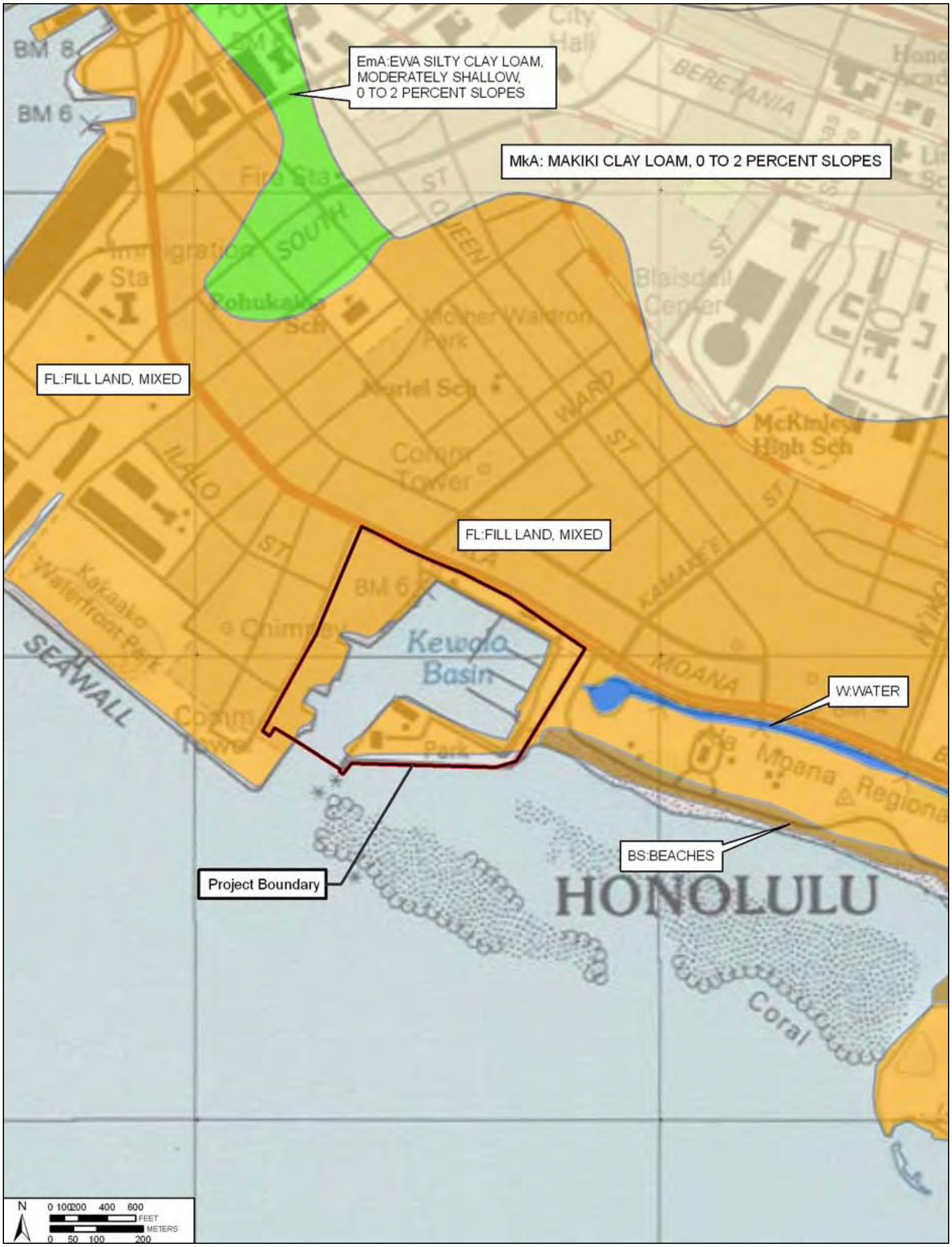

Figure 4. Soils map of Kewalo Basin vicinity (from Foote et al. 1972)

Section 2 Background Research

The project area is located in an area today generally called Kewalo. On early historic maps, the project area is more specifically identified with the place names "Kukuluāeʻo" on the east (roughly east of an imaginary *mauka* extension of Ahui Street) and "Kaʻākaukukui" on the west (roughly west of an imaginary *mauka* extension of Ahui Street), The traditional area called Kewalo was generally considered that area *mauka* of Kukuluāeʻo and Kaʻākaukukui, although it had a small beach area near the eastern terminus of Queen Street (approximately 400 m east of the present study area). For the purpose of this study, the name Kewalo is used, (the name the area is best known as today).

2.1 Pre-Contact to Early Nineteenth Century

Kewalo was situated between two centers of population and activity on the southern shore of pre-contact Oʻahu: Kou and Waikīkī. In Waikīkī, a system of irrigated taro *loʻi* fed by streams descending from Makiki, Mānoa, and Pālolo valleys blanketed the plain, and networks of fish ponds dotted the shoreline. Similarly, Kou - the area of downtown Honolulu on the east side of Nuʻuanu Stream and extending to the south east adjacent to the harbor - possessed shoreward fish ponds and irrigated fields watered by ample streams descending from Nuʻuanu and Pauoa valleys.

Rev. Hiram Bingham, arriving in Honolulu in 1820, described a still predominantly native Hawaiian environment - still a "village" - on the brink of western-induced transformations:

> We can anchor in the roadstead abreast of Honolulu village, on the south side of the island, about 17 miles from the eastern extremity... Passing through the irregular village of some thousands of inhabitants, whose grass thatched habitations were mostly small and mean, while some were more spacious, we walked about a mile northwardly to the opening of the valley of Pauoa, then turning southeasterly, ascending to the top of Punchbowl Hill, an extinguished crater, whose base bounds the northeast part of the village or town... Below us, on the south and west, spread the plain of Honolulu, having its fishponds and salt making pools along the seashore, the village and fort between us and the harbor, and the valley stretching a few miles north into the interior, which presented its scattered habitations and numerous beds of kalo (arum esculentum)in its various stages of growth, with its large green leaves, beautifully embossed on the silvery water, in which it flourishes. (Bingham 1981:92-93)

The Kewalo region would have been in Bingham's view as he stood at "Punchbowl Hill" looking toward Waikiki to the south: it would have comprised part of the area he describes as the 'plain of Honolulu' with its "fishponds and salt making pools along the seashore."

Another visitor to Honolulu in the 1820s, Jacobus Boelen, hints at the possible pre-contact character of Honolulu and its environs, including the Kewalo area:

> It would be difficult to say much about Honoruru. On its southern side is the harbor or the basin of that name (which as a result of variations in pronunciation [sic] is also written as Honolulu, and on some maps, Honoonoono). The

> landlocked side in the northwest consists mostly of tarro fields. more to the north there are some sugar plantations and a sugar mill, worked by a team of mules. From the north toward the east, where the beach forms the bight of Whytetee, the soil around the village is less fertile, or at least not greatly cultivated. (Boelen 1988:62)

Boelen’s description suggests preliminarily that the Kewalo region *mauka* of the present study area are within a “not greatly cultivated” region of Honolulu perhaps extending from Pūowaina (Punchbowl crater) at the north through Kaka‘ako to the Kālia portion of Waikīkī in the east. Kewalo is named in John Papa ‘Ī‘ī’s account of the death in 1810 of Isaac Davis, an American sailor who had settled in the Hawaiian islands, becoming a confidant of Kamehameha:

> Many chiefs and notables mourned Davis, including Kamehameha and the company of warriors who watched over him. The funeral procession went from Davis’ dwelling at Aienui to Kewalo, where his body was deposited on the land of Alexander, a haole who had died earlier. At the time of his death, Davis was an old man with white hair and other signs of age. (‘Ī‘ī 1959:85)

The distance inland (perhaps in the vicinity of the King and Pi‘ikoi street intersection) supports the concept that the place name “Kewalo” was widely used to refer to areas further inland than we associate with the place name today. An article about Davis in *The Friend* newspaper of February 1862 mentions only that his grave was “in a burying place of the Europeans, near Hana-rura,” suggesting that the Kewalo region and the “burying place” were outside the limits of Honolulu both at the time of Davis’s death and 52 years later when the article was written.

An early, somewhat generalized depiction of the pre-contact native Hawaiian shaping of Waikīkī, Honolulu, and the Kewalo region - along with a possible location of the “burying place of the Europeans” within Kewalo - is given on an 1817 map (Figure 5) by Otto von Kotzebue, commander of the Russian ship *Rurick*, who had visited O‘ahu the previous year. The map shows taro *lo‘i* (the rectangles) massed around the streams descending from Nu‘uanu and Mānoa valleys. The depicted areas of population and habitation concentration (indicated by the trapezoids, however, probably reflect distortions caused by the post-contact shift of Hawaiians to the area around Honolulu harbor - the only sheltered landing on O‘ahu and the center of increasing trade with visiting foreign vessels. Kamehameha himself had moved from Waikīkī to Honolulu in 1809.

Kotzebue’s map (Figure 5) suggests that the land between Pūowaina (Punchbowl crater) and the shoreline - which would include the Kewalo area - formed a “break” between the heavily populated and cultivated centers of Honolulu and Waikīkī: the area is only characterized by fishponds, trails connecting Honolulu and Waikīkī, and occasional taro *lo‘i* and habitation sites. Interestingly, the only specifically identified feature in the entire area is the cemetery (well to the northeast of the present study area), and this may be the location of Davis’ and other foreigners’ burials in Kewalo.

From the Malden map of 1825 (Figure 6) on there is a high degree of consistency in depictions of the natural coastline in the vicinity of the study area as very close to the Ala Moana/Nimitz alignment.

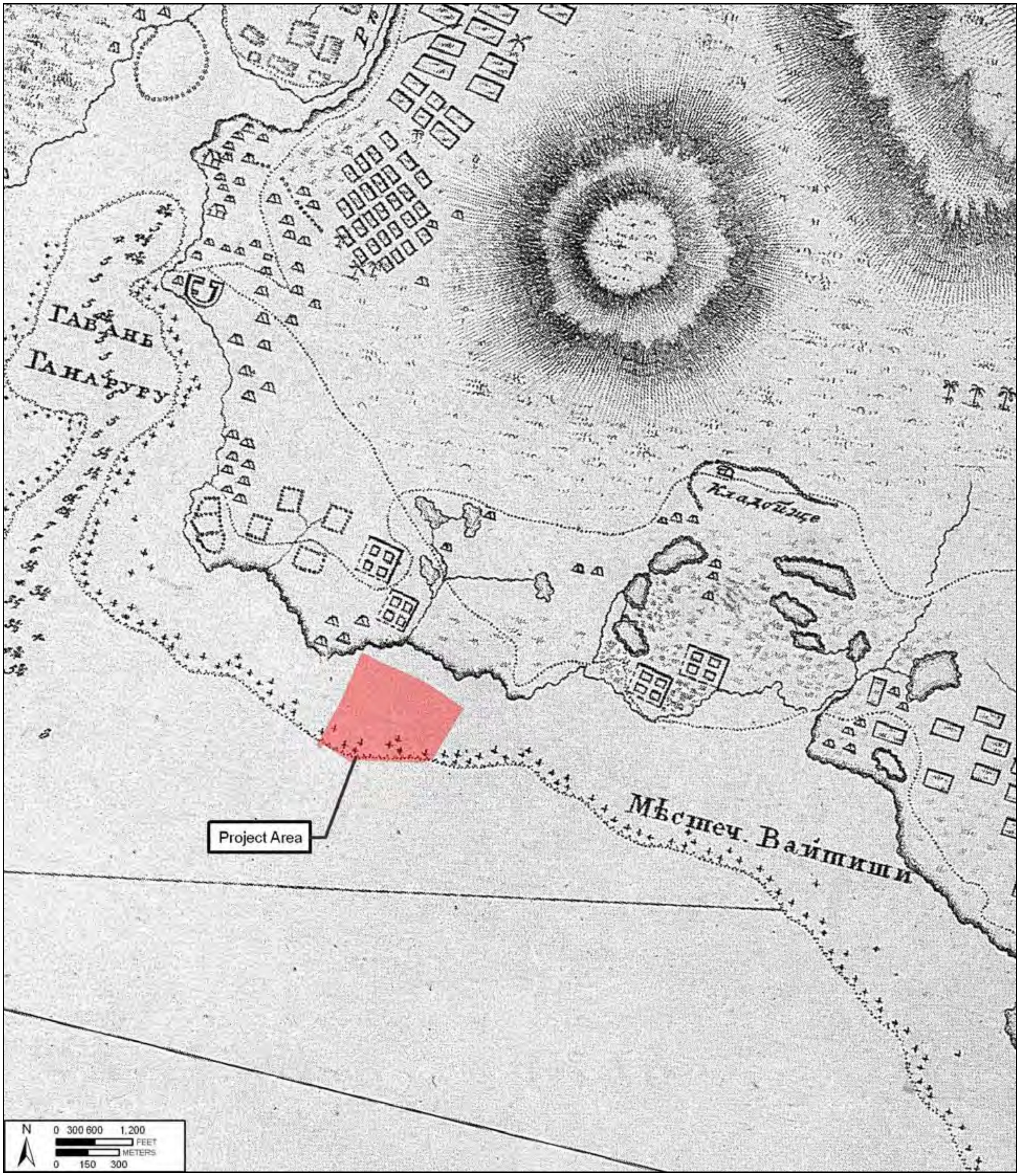

Figure 5. 1817 map by Otto von Kotzebue, commander of the Russian ship *Rurick*, showing study area (Note: a portion of the foreigner’s cemetery where Isaac Davis is believed to have been buried and that John Papa ‘Ī‘ī associates with “Kewalo” is located in the middle of the right side (labeled in Russian as “Кладбище**”)** This early map probably should be understood as schematic sketch (map reprinted in Fitzpatrick 1986:48-49)

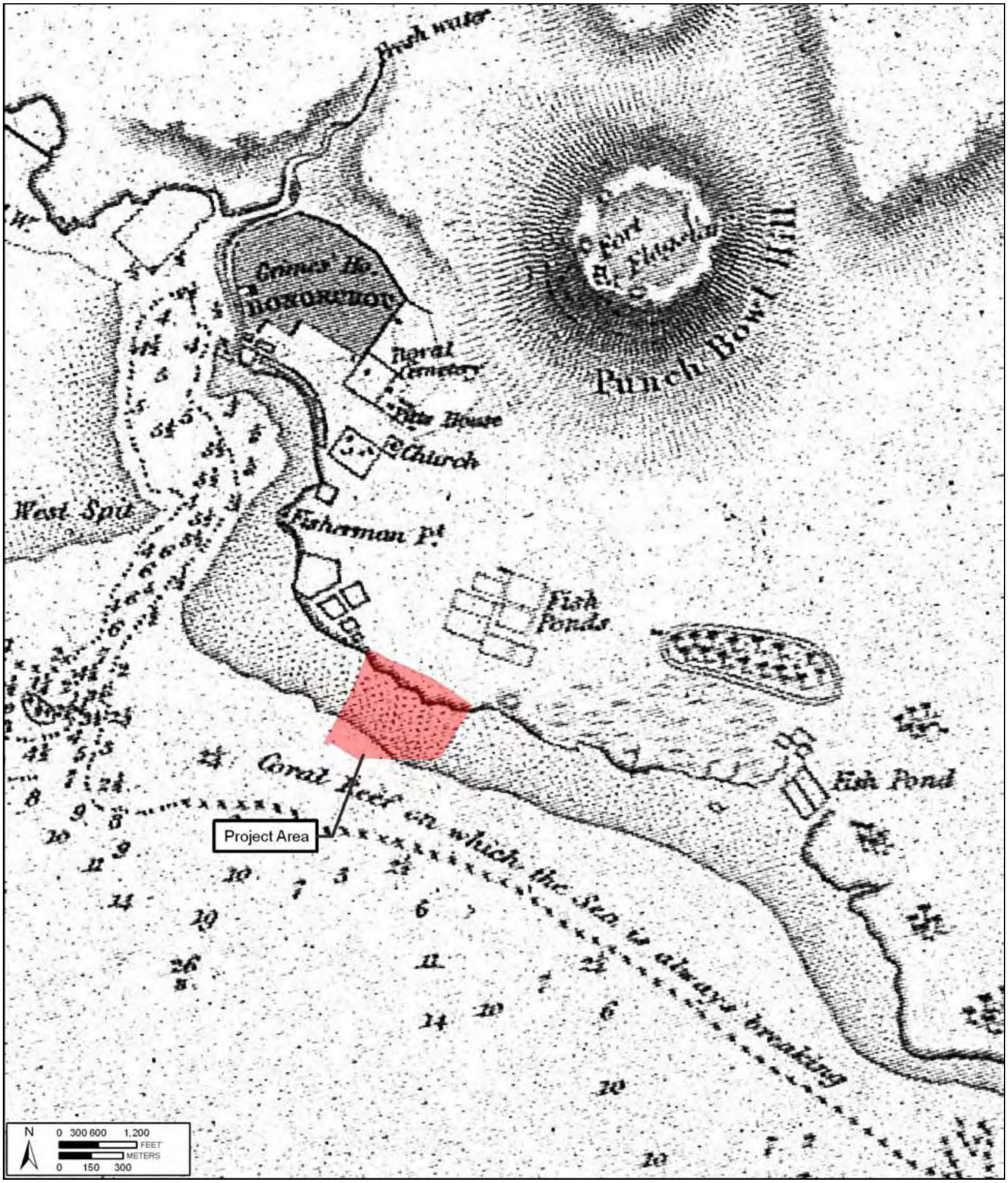

Figure 6. 1825 map of “South Coast of Woahoo and Honorurou Harbour” by Lt. Charles Malden, showing study area (this and later Nineteenth Century maps show the natural dry land coastline fairly consistently as very close to the present Ala Moana/Nimitz alignment (Registered Map No. 431, Hawai‘i Land Survey Division)

Most maps of the nineteenth Century (Malden 1825, see Figure 6; La Passe 1855, Figure 7; Oahu Island Government Survey 1881 map, Figure 8; Oahu Government Survey 1884 map, Figure 9) show the present project area and vicinity quite similarly. Most notably these maps show all but the most inland margin of the present study area as in the water (albeit mostly within a shallow reef flat that may have been partially exposed at low tide). These maps often show polygons *mauka* of the project area, near the former coast that do not appear to relate to the cartographer’s conventions for fish ponds or taro *lo‘i*. At least a partial explanation is suggested by the Oahu Island Government Survey 1881 map (see Figure 8) that shows a quite extensive “Kaka‘ako Salt Works” just inland and northwest of the present study area. The salt works were probably pre-Contact in origin, expanded greatly in the early post-Contact period, and continued well into the twentieth century (Figure 10). This suggests (as do other lines of evidence) that the lands inland of the present study area were quite low-lying until overlain with fill in the early twentieth century.

2.2 Mid Nineteenth Century and the Māhele

Among the first descriptions of Kaka‘ako and Kewalo by the Hawaiians themselves are testimonies recorded during the 1840s in documents associated with land awards and awardees of the Great Māhele. These records bring the present study area into clearer focus. A portion of a modern tracing of an 1884 map by S. E. Bishop (see Figure 9) shows the disposition of Land Commission Awards (LCAs) granted in the environs of the study area. The tracing includes some modern streets not present in 1884. These additions, however, permit an accurate positioning of the study area on the 1884 map. This general depiction is believed to be quite accurate, with the annotated “Beach Road,” that runs along the edge of the sea, becoming the present Ala Moana Boulevard/Nimitz Highway alignment.

The ‘*ili* of Ka‘ākaukukui (LCA 7713) was awarded to Victoria Kamāmalu, sister of Kamehameha IV and Kamehameha V. There were no awards to commoners in this ‘*ili*, which seems to have consisted entirely of land used for salt making. No residences are shown in this area until the twentieth century. The largest settlement in the vicinity was the village of Honuakaha, at the corner of Punchbowl and Queen Streets (well to the northwest). A large number of houselots was awarded to commoners in this area, and late nineteenth-century and early twentieth-century maps always show a cluster of houses in this area.

The ‘*ili* of Kukuluāe‘o was originally awarded to the king as LCA 387, but he returned it to the government. The ‘*ili* was then awarded to the American Board of Commissioners for Foreign Missions (see Figure 9 “AB Mission”). Initially this land was associated with Punahou School in Mānoa Valley, as Chief Boki gave the Punahou lands to Hiram Bingham, pastor of Kawaiaha‘o Church in 1829 (DeLeon 1978:3). In the Māhele, however, this land became “detached” from the Mānoa award and was instead given to the pastor of the Kawaiaha‘o Church (Foster 1991).

Testimonies describe the land - identified as “Punahou” (relating to the main ABCFM holding) - and the background of the ABCFM’s claim to it alluding to the somewhat unclear *makai* edge (owing to the presence of a wide tidal flat):

> The boundaries of that part which lies on the sea shore we cannot define so definitely, but presume there will be no difficulty in determining them, as it is commonly known as pertaining to Punahou. This part embraces fishing grounds, coral flats and salt beds.

Figure 7. 1855 map of Honolulu by Lt. Joseph de LaPasse of the French vessel, *L`Eurydice*; project area is adjacent to the southeast of an area labeled “*Pecheries*” (“Fishponds”) (map reprinted in Fitzpatrick 1986:82-83)

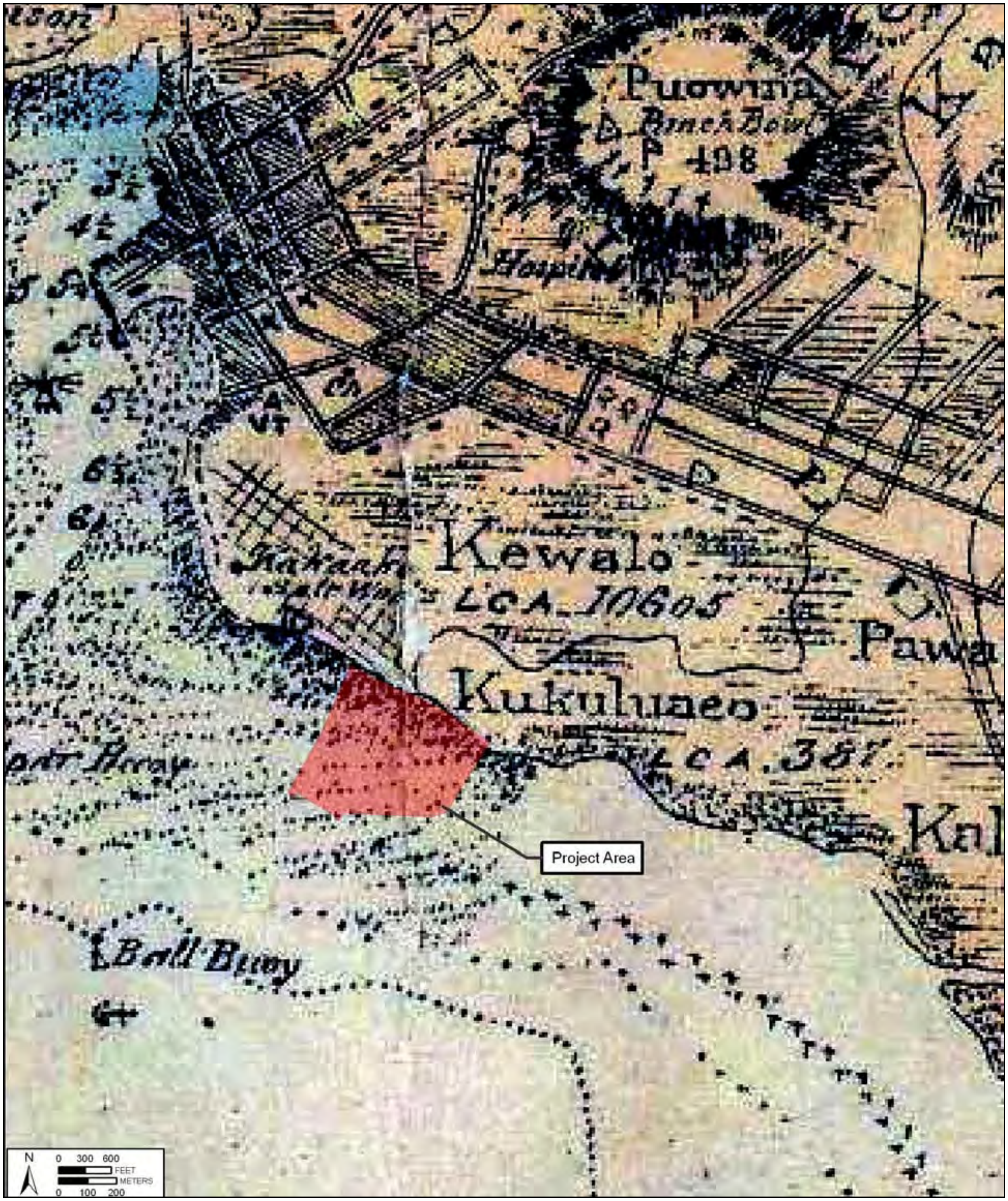

Figure 8. 1881 Oahu Island Government survey map by R. Covington, showing study area; note: extensive “Kakaako Salt Works” just inland and northwest of the present study area (Hawai‘i Land Survey Division, Registered Map No. 1381)

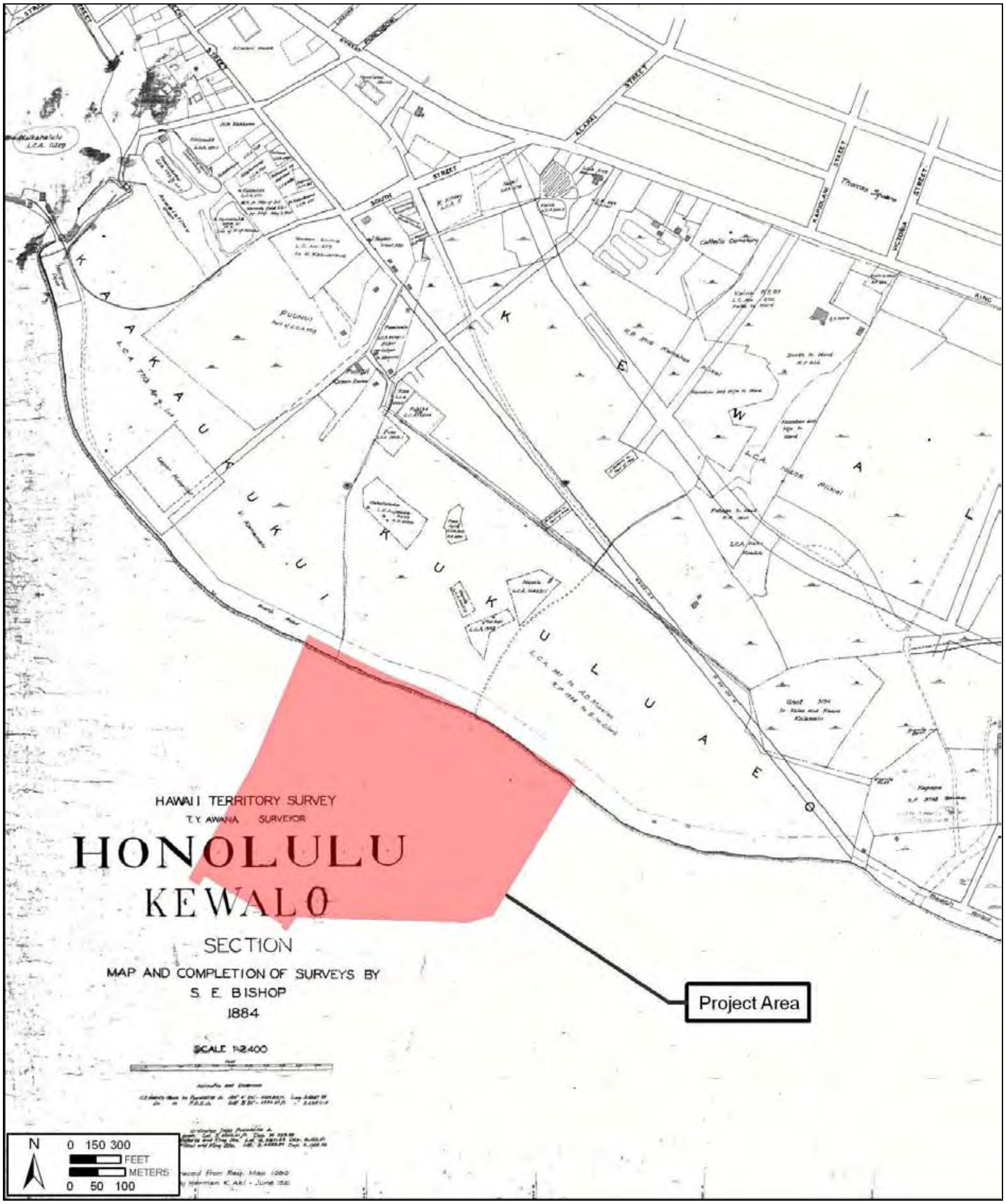

Figure 9. 1884 map of Honolulu, Kewalo Section map, by Sereno Bishop, showing Land Commission Awards (LCAs) in the vicinity of the study area; note in the extreme west are the Waikahalu‘u lands that were filled in circa 1887 (Hawai‘i Land Survey Division, Registered Map 1090)

Figure 10. 1902 photograph of the Kewalo Brine Basins; the Kaka'ako salt works may have extended back to pre-contact times and are shown here going strong in 1902; photo in the general vicinity of today's Ward Warehouse (photograph in Scott 1968:579)

> The above land was given by Boki to Mr. Bingham, then a member of the above named Mission and the grant was afterwards confirmed by Kaahumanu. (*Foreign Register*, Vol. 2:33)
>
> The *Makai* part of Punahou is bounded *Mauka* by "Kewalo" and "Koula", Waititi side by "Kalia", seaward it extends out to where the surf breaks. Honolulu side by "Honolulu."
>
> This land was given to Mr. Bingham for the Sandwich Island Mission by Gov. Boki in 1829... From that time to these the S. I. Mission have been the only Possessors and *Konohiki* of the Land.
>
> The name of the *Makai* part is Kukuluaeo. There are several tenants on the land of Punahou whose rights should be respected." (*Foreign Testimony*, Vol. 3:115)

The *ʻili* of Kewalo (LCA 10605) was awarded to Kamakeʻe Piʻikoi, wife of Jonah Piʻikoi (awardee of Pualoalo ʻIli), as part of LCA 10605, *ʻāpana* (lot) 7. The award was shared between husband and wife (Kameʻeleihiwa 1992:269). Kewalo was a large 270.84-acre land section extending from Kawaiahaʻo Church to Sheridan Street. This land section had numerous large fishponds, which were awarded as part of the claim to Piʻikoi.

That the area well inland of the present study area was indeed quite low-lying, including exposed coral flats dotted with salt pans and fish ponds well into the nineteenth century is corroborated in the testimonies recorded for individual *kuleana* awards to some of the commoners on that land "whose rights should be respected."

LCA 1503 to Puaa is recorded as consisting of three fish ponds and a houselot.

LCA 1504 to Pahiha (Pahika on the 1884 map) explicitly defines the general area:

> "Peka W.[wahine] sw. I know this place. It is on the salt plains of Honolulu, used for making salt.
>
> *Mauka* is a stream of salt water. Waititi is several salt ponds - Napela, Kuniae and others own them. Makai - Gov't road. Honolulu - Peka Kaula, Lilea, Bolabola, Poe.
>
> Claimant recd this land from his father who died last year and held it a long time back in Kinau's time." (*Foreign Testimony*, Vol. 3:220)

LCA 9549 to Kaholomoku comprised "three ponds, a salt *moʻo* (*Native Register*, Vol. 4:477)

LCA 10463 to Napela is recorded as consisting of "2 ponds, a ditch, 2 deposits, a house site and a salt land section in two pieces: (*Native Testimony*, Vol. 10:445)

Within Kewalo itself is LCA 3169 to Koalele:

> Mahoe, sworn, says he knows the land of Claimant in ʻKewaloʼ.
>
> It consists of some *kalo* patches *mauka* and some *Lokos* [fish ponds] *makai*.
>
> The *kalo* patches are bounded *mauka* by Kealoha; bound Waikiki side by Kuaipaka's, *makai* by the *konohiki*, ʻEwa side by J. Booth.

> The fish ponds are bounded *mauka* by the *konohiki*. Waikiki and *makai* side, the same. Honolulu side by J. Booth.
>
> Clt received his land from Kapihi in the life time of Kinaʻu and he has held the same without dispute till the present time.” (*Foreign Testimony*, Vol. 3:507)

The *mauka* portion of Koalele’s claim which includes the taro patches is not shown on the 1884 map; it is likely somewhere immediately *mauka* of King Street. The *makai* portion - the “*Lokos*” or fish ponds - is shown located northeast of the present study area.

The LCA records thus help clarify both the pre-contact and mid-nineteenth century pictures of the study area vicinity. They suggest that the traditional Hawaiian usage of the Kewalo region and its environs may have been confined to salt making and farming of fishponds, with minimal wetland agriculture in those areas *mauka* or toward Waikīkī at the very limits of the field system descending from Makiki and Mānoa. The characterization by a native Hawaiian of the expanse within the present study area as the “salt plains of Honolulu” itself suggests the environmental limitations that would have made the general region less desirable for long-term permanent habitation by any sizeable population. However, the testimonies do indicate that the area was lived on and was shaped by Hawaiians before the nineteenth century.

The LCA records also reveal that, midway through the nineteenth century, taro cultivation and the traditional salt making and fishpond farming activities continued within the environs *mauka* of the present study area. These activities and the land features that supported them would be eliminated during the remainder of the nineteenth century by the increasing urbanized expansion of Honolulu.

The 1884 Honolulu Kewalo Section map (see Figure 9), and a Wall 1887 Government Survey Map (Figure 11) show the nascent traces of the future development in the grid of roads being developed well *mauka* of the study area. Until quite late in the 1800s urban growth focused north of King Street and west of Punchbowl Street (far north and west from the present study area) owing to the low-lying marshy nature of the lands in the vicinity of the present study area.

2.3 Late Nineteenth Century

Of note are late nineteenth century changes to the land beginning a kilometer to the northwest of the study area. In 1857 Honolulu Fort was demolished, its walls became a 2000-foot retaining wall used to extend the land out onto the shallow reef in the harbor. The remaining materials were used as fill to create what came to be known as the “Esplanade” (Wong Smith and Rosendahl 1990:12) largely built on properties known as Waikahaluʻu that had been owned by Queen Hakaleleponi Kalama (wife of Kauikeaouli Kamehameha III). Between 1857 and 1870, 22 acres of reef land between Fort Street and Alakea Street was filled in with material dredged from the harbor (Rush 1957:14). Filling activity then continued to the east seaward of Richard and Punchbowl streets in 1887. The 1887 Wall map (see Figure 11) shows the brand new, in-progress, lay out of streets in the area between Richards Street and Punchbowl Street (near the Prince Kūhiō Federal Building). Thus circa 1886/1887 the filling of the shallow seas to the northwest of the study area had begun but there had been little infill seaward of the Ala Moana/Nimitz at that time anywhere.

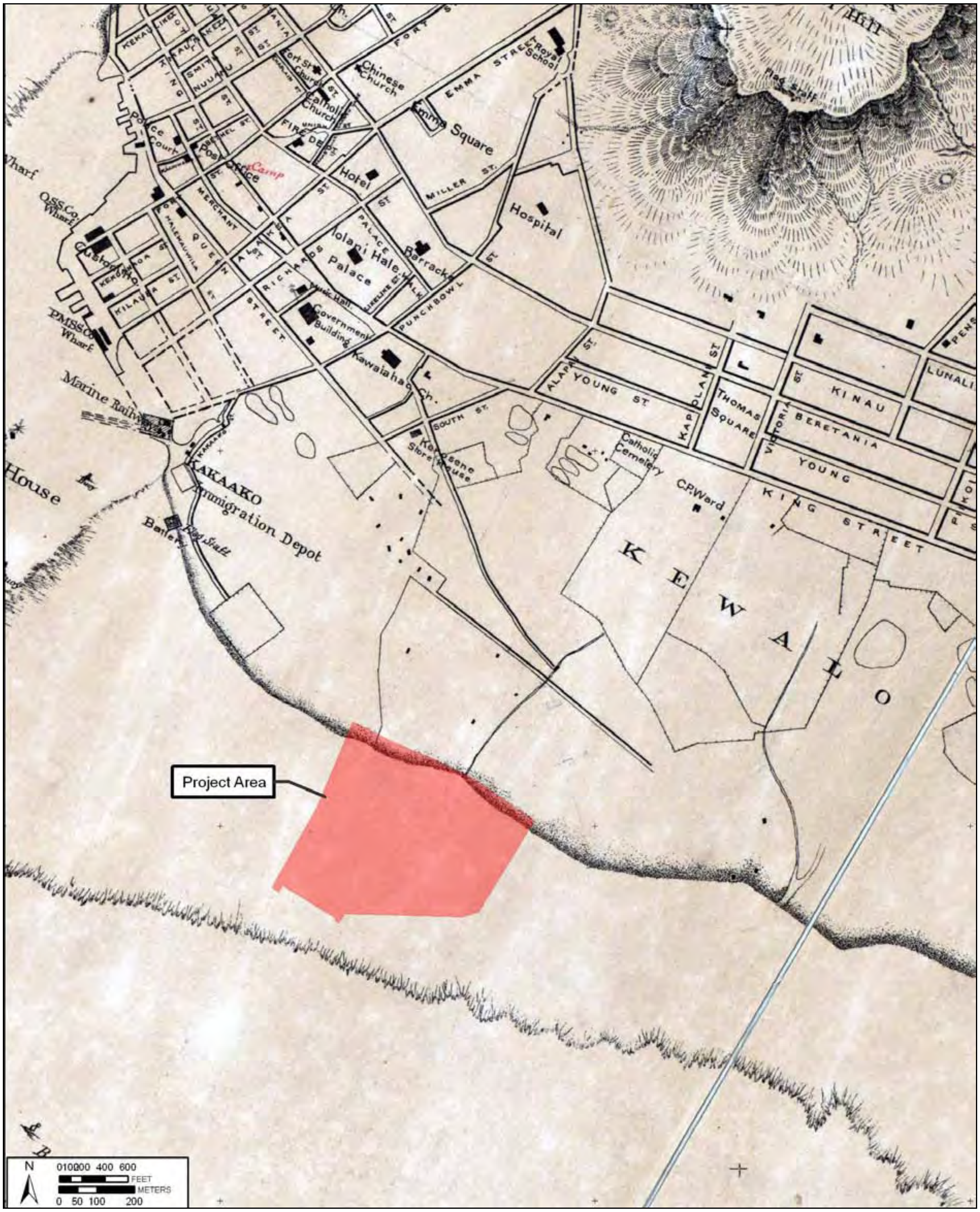

Figure 11. 1887 map of Honolulu and Vicinity by W. A. Wall, showing lack of road and residential development in Kakaʻako in the vicinity of the present study area in the late nineteenth century (Map on file at U. S. Library of Congress)

An 1897 Monsarrat map (Figure 12) indicates that there had been very little filling of the coastal shallows in the previous decade. This map shows the development of the coastal area, with commercial wharfs and recreational boathouses built out over the low reef. In 1884-1887, a “Marine Railway” was developed by Lyle and Sorenson a kilometer to the northwest of the present study area (see Figure 11, Figure 12 and Figure 13) that facilitated the haul out of ships for bottom scrapping and propeller checks.

Also of interest is the establishment of a long pier in the waters to the northwest of the present study area that had branching piers leading to the King’s (Kalākaua’s) Boat House (Figure 12 & Figure 14), Myrtle Boat House (club), and Healani Boat Club House. While outrigger canoes were paddled and sailed, and five-oared whaleboats were raced, the main sport for the rival Myrtle and Healani Boat Clubs was six-oared sliding-seat “barges” – “in addition to things hanky-panky” (Scott 1968:195).

Of note on the 1897 Monsarrat Map (see Figure 12) is a large U-shaped sea wall just south of the boat house pier that enclosed a large tract of shallow sea located 700 m northwest of the present study area that is also visible in a view from Punchbowl of the time (Figure 15). The 1911 Podmore map (Figure 16) shows this area west of the present study area being rapidly developed through land fill (largely filled with sand and coral from Honolulu Harbor dredging operations) to accommodate a new US Naval Reservation, US Immigration Depot, and Fort Armstrong Military Reservation. The Podmore map indicates a “proposed sea wall” extension extending southeast from the initial seawall and roughly parallel to the coast. An interesting aspect of the 1911 Podmore map (Figure 16) is the evident plan for an eastern extension of the Nimitz Highway alignment well seaward of (but roughly parallel to) Ala Moana Boulevard. This vehicular artery (that was never built) would have run through the middle of the present Kewalo Basin on filled lands. Clearly plans changed for Kewalo Basin per se was never filled (the 1911 Podmore map scenario was not realized) but was in fact dredged by 1927. The Podmore map (Figure 16) indicates that the present study area (with the possible exception of a small sliver at the northwest corner under Ala Moana Blvd.) was “mud and coral flats covered at high tide” as late as 1911.

During the monarchy, the point at Kaka‘ako 700 m northwest of the present study area was the location for a battery, with three cannons used to salute visiting naval vessels, which responded with their own cannon salutes (Figure 17). Other saluting batteries were at the top of Punchbowl Crater and at the Honolulu Fort (Dukas 2004:163). The *Hawaiian Annual and Almanac for 1887* (Thrum 1887:37) reported that $4,500 had been spent to build the battery. It was used for gun salutes up to at least the overthrow of the monarchy in 1893 (Judd 1975:57).

After the annexation of the islands by the United States in 1899, the U.S. Congress began to plan for the coastal defenses of their new islands. The major batteries were placed at Pearl Harbor and in Waikīkī, but a small reservation, named Fort Armstrong (Figure 18), was also set up on the Ka‘ākaukukui Reef as a station for the storage of underwater mines. Fort Armstrong (1899 to 1950s) was named after General Samuel Chapman Armstrong (1839-1893) who was born on Maui and graduated from Punahou School. He was a hero of the Union defense of Cemetery Ridge at Gettysburg. Battery Tiernon, with two 3 inch 1903 guns, was built at this site in 1911, and took over the job of saluting visiting naval vessels once performed by the Kaka‘ako battery (Williford and McGovern 2003:15).

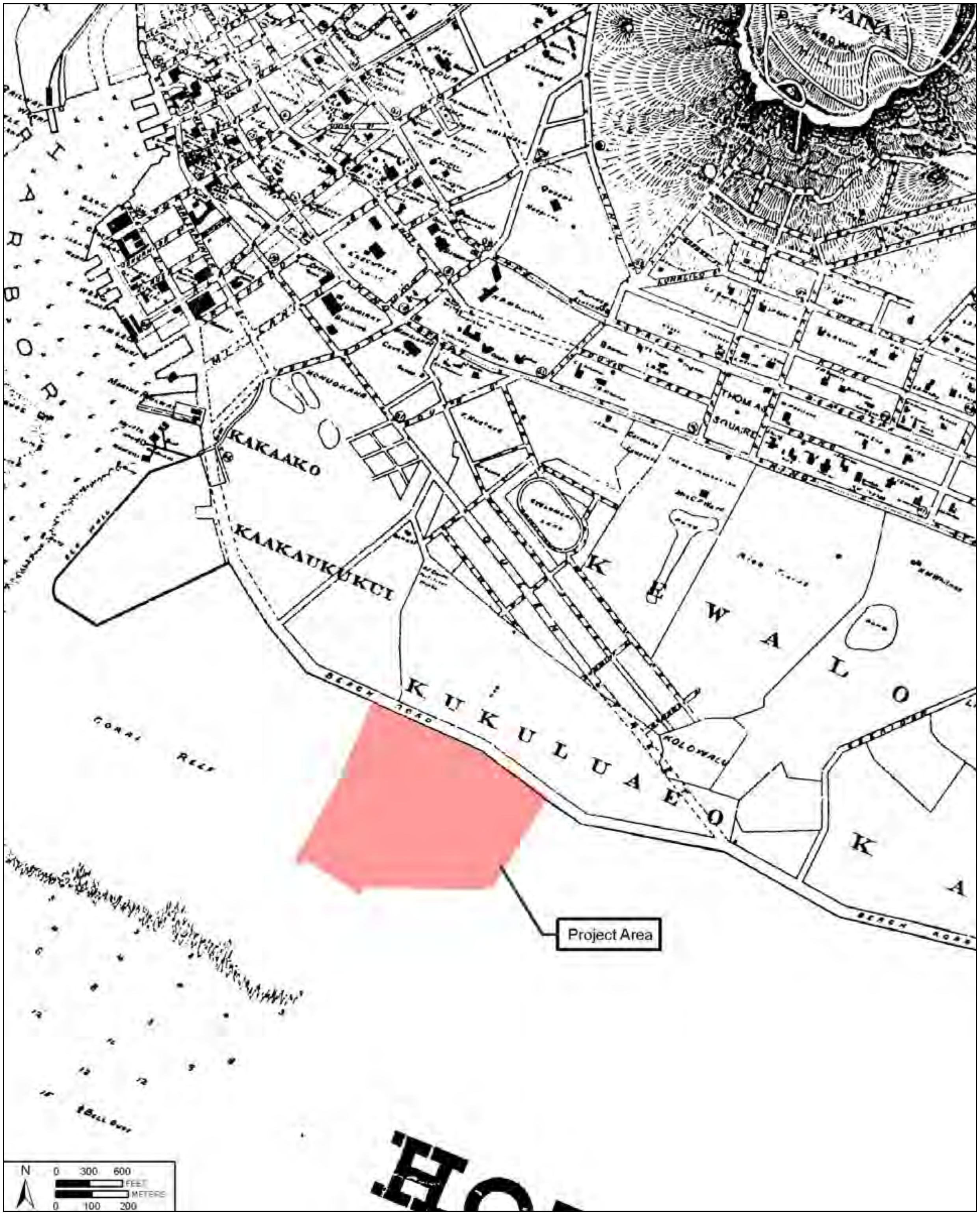

Figure 12. 1897 map of “Honolulu, Hawaiian Islands” by M. D. Monsarrat map, showing study area (Hawai‘i Land Survey Division, No Registered Number)

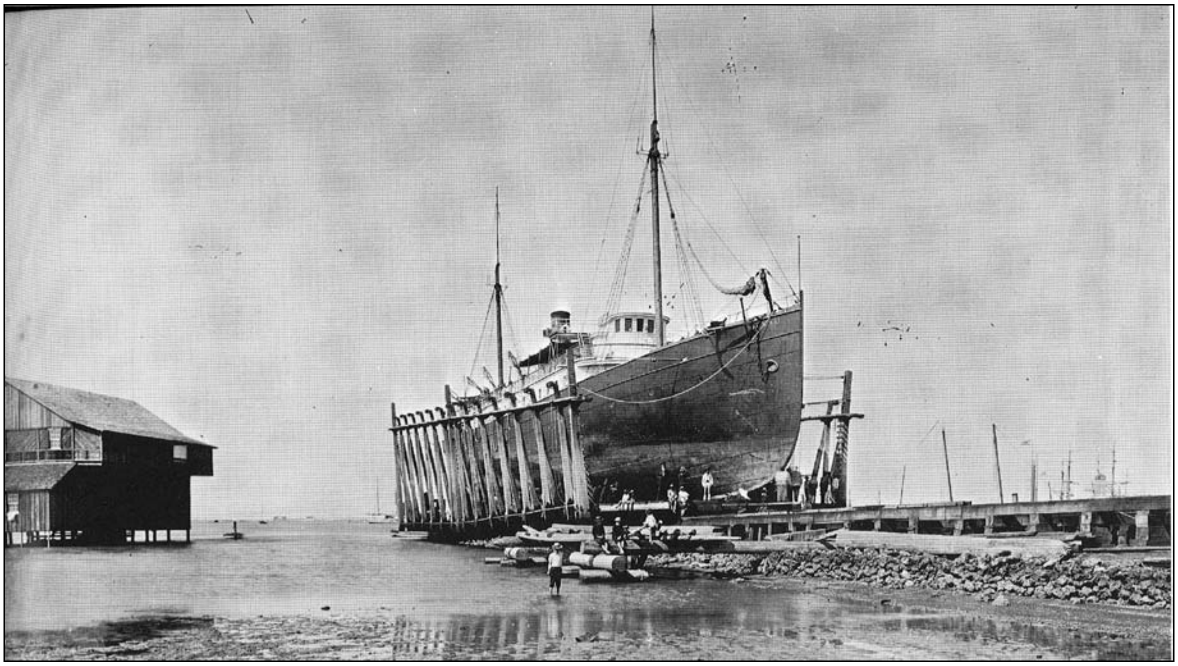

Figure 13. Lyle and Sorenson's "Marine Railway" constructed circa 1885 a kilometer northwest of the study area for the haul out of ships; Note: the extensive shallow mudflat (Original photograph at Hawaiʻi State Archives, reprinted in Scott 1968:209)

Figure 14. View of the King's (Kalākaua's) Boathouse a kilometer northwest of the study area circa 1890 – this land would soon be filled in to create the Pier 1 area (Ray Jerome Baker Collection, Kamehameha Schools Archives)

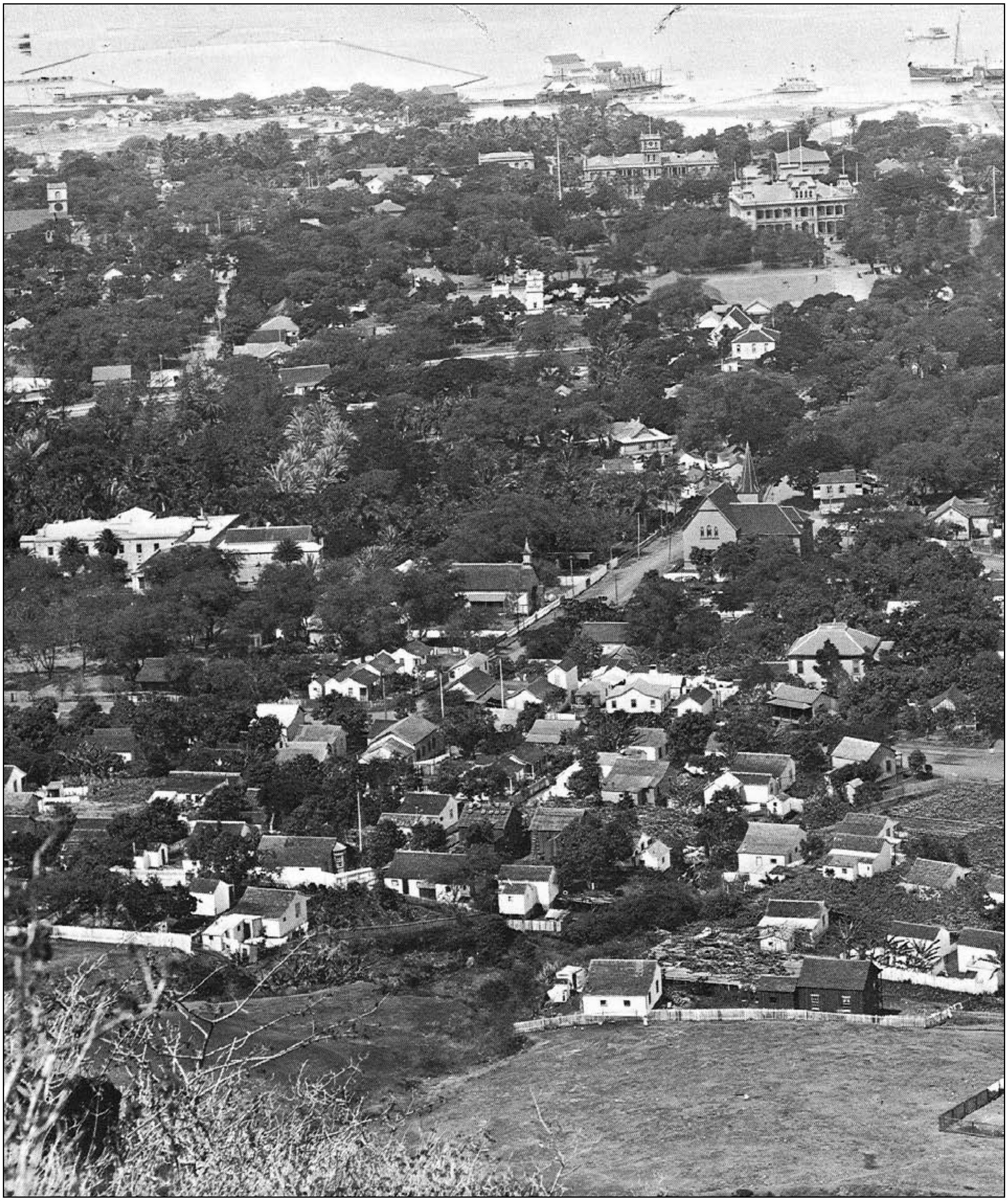

Figure 15. In this 1894 photograph of the Honolulu waterfront taken from the top of Punchbowl (Kawaiahaʻo Church and ʻIolani Palace are clear landmarks) seaward land reclamation with a new seawall is quite pronounced at the upper left (photograph from Scott 1968:266)

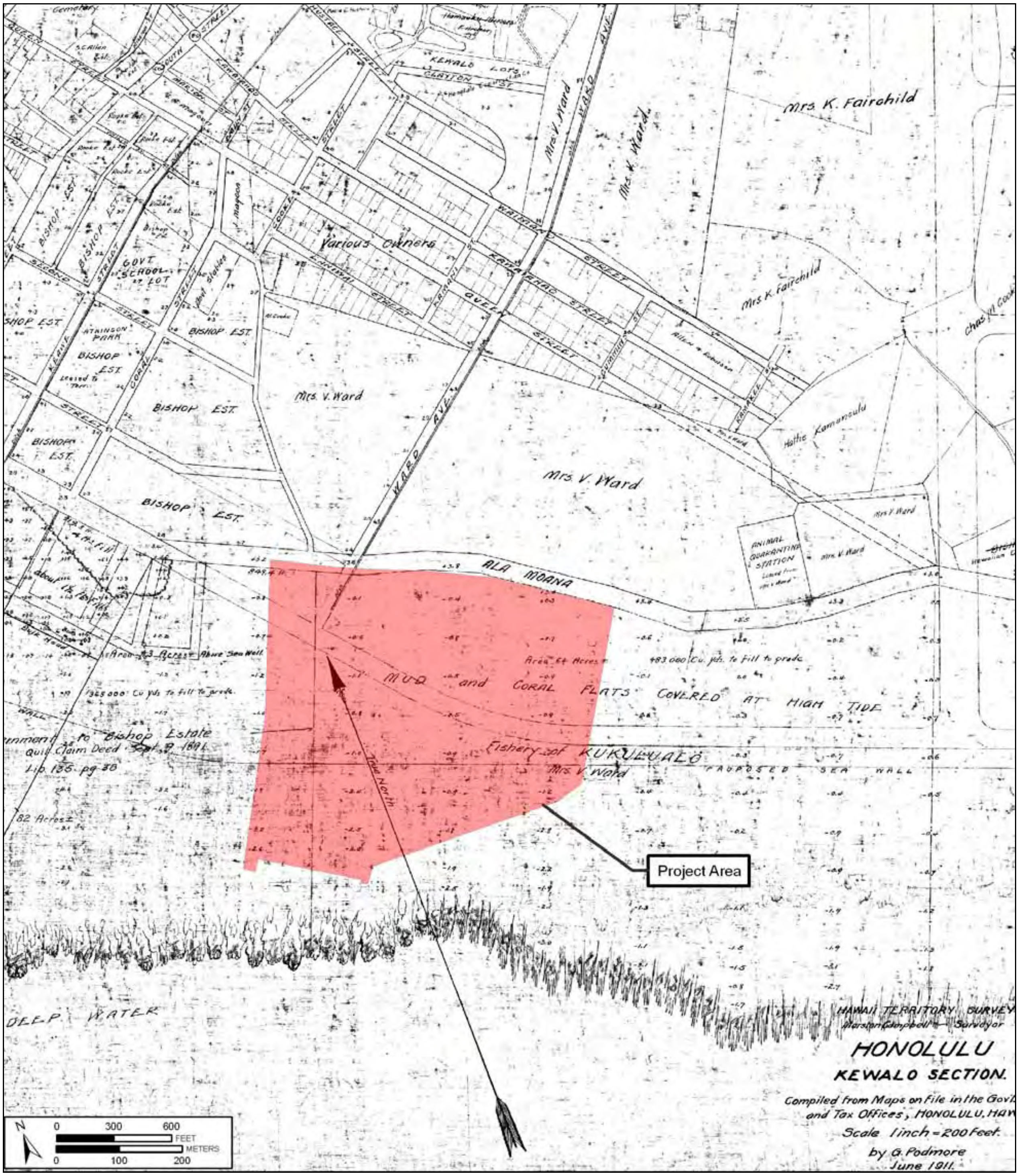

Figure 16. 1911 G. Podmore map of “Honolulu, Kewalo Section,” showing study area; note: the proposed extension of today’s Nimitz Hwy. on fill land seaward of Ala Moana Boulevard through today’s Kewalo Basin was never built (Hawai‘i Land Survey Division, Registered Number 3094)

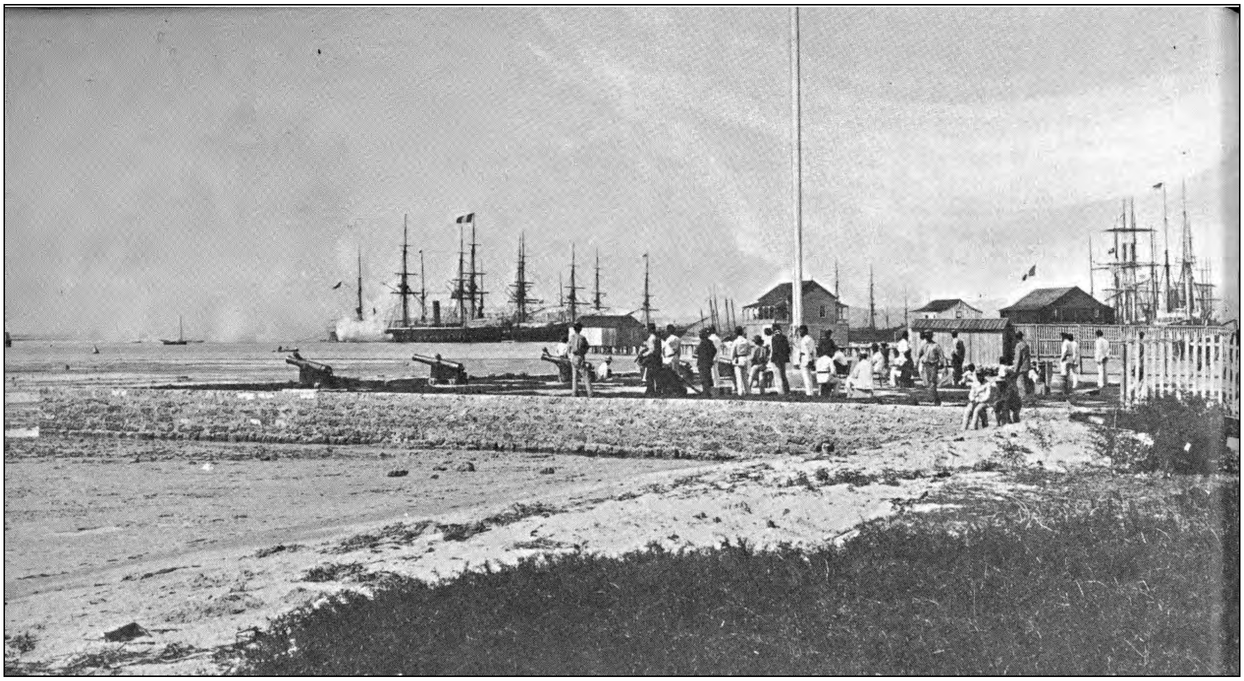

Figure 17. 1887 photograph of the Kakaʻako Saluting Battery and flagstaff 700 m northwest of the present study area (original photograph taken by Karl Kortum and archived at the San Francisco Maritime Museum; reprinted in Scott 1968:176)

Figure 18. Colorized postcard (ca. 1911-1920) of Fort Armstrong established on land understood as created by land fill over shallow reefs circa 1911 (Original black and white photograph at Hawaiʻi State Archives; reprinted in Wisniewski 1984:18)

In the attack on the islands in December 7, 1941, the fort escaped relatively unscathed; only one motor pool structure was hit. Antiaircraft shells were fired from the fort, but were ineffective; at least one hit the town rather than any aircraft (Richardson 2005:34). In the 1950s, the federal government returned most of Fort Armstrong to the Territory of Hawai‘i, which used the area to expand the shipping piers of the harbor.

2.4 Twentieth Century

2.4.1 Dredging and Land Fill Operations in the Kewalo Basin Area

A 1919 Fire Control Map (Figure 19) by the U.S. Army Corps of Engineers indicates that into the 1920s large portions of Kewalo - including the vicinity of the study area - were yet to be developed. It appears that much of the southeast extension of the seawall indicated in the Podmore map of 1911 (see Figure 16) had more-or-less been developed with Fort Armstrong largely completed on the northwest side and the southeast end of the seawall enclosure, including the northwest corner of the present study area, still undeveloped (and perhaps largely still water within the impoundment). Much of the landfill on the west side of Kewalo Basin (Figure 20) within the impounding seawall is understood to have occurred in the early 1920s through a somewhat ad hoc process of municipal trash dumping and burning. Figure 22 shows this “perpetual volcano” burning refuse dump that is understood to have formed the west side of Kewalo Basin.

Prior to dredging, Kewalo Basin was a natural deep pocket in the reef seaward of Ala Moana Boulevard between Ward Ave and Kamake‘e Street (Figure 21) that had been used as a canoe landing since pre-Contact times and probably used since the early historic period as an anchorage. The expansion of Kewalo Basin was part of the 1920s and early 1930s dredging operations that included the Ala Wai Canal, Ala Wai Basin, and Ala Moana Beach Park (Figure 23). After the dredging of the Ala Wai Canal, the Ala Wai and Kewalo Basins were dredged, along with a connecting channel that was later filled in. The dredged material was used for fill in and around the basins, and in the area that became Ala Moana Beach Park (Johnson 1991:364).

Most of the land between Kewalo Basin and Fort Armstrong, to the north-west, had been previously filled (ca. 1900-1920). The area between Kewalo Basin and Fort Armstrong, *makai* (seaward) of Ala Moana, became a part of Kaka‘ako called “Squattersville” – a somewhat notorious and sprawling “homeless” settlement.

> All Squattersville, like Gaul, is divided into three parts. There is the original settlement at Kewalo Basin Point, there is a tiny offshoot of this and there is the later settlement along Ala Moana” (Johnson 1991:111).

Later (ca. 1925-1930) dredging and filling created Ala Moana Beach Park and commercial dock space at the Ala Wai and Kewalo Basins. In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor of Kewalo for the aim of “harbor extension in that it will be made to serve the fishing and other small craft, to the relief of Honolulu harbor proper” (Thrum 1920:147).

The progress of the dredging for Kewalo Basin was summarized in a 1921 report from the Governor of Hawai‘i to the U.S. Department of the Interior:

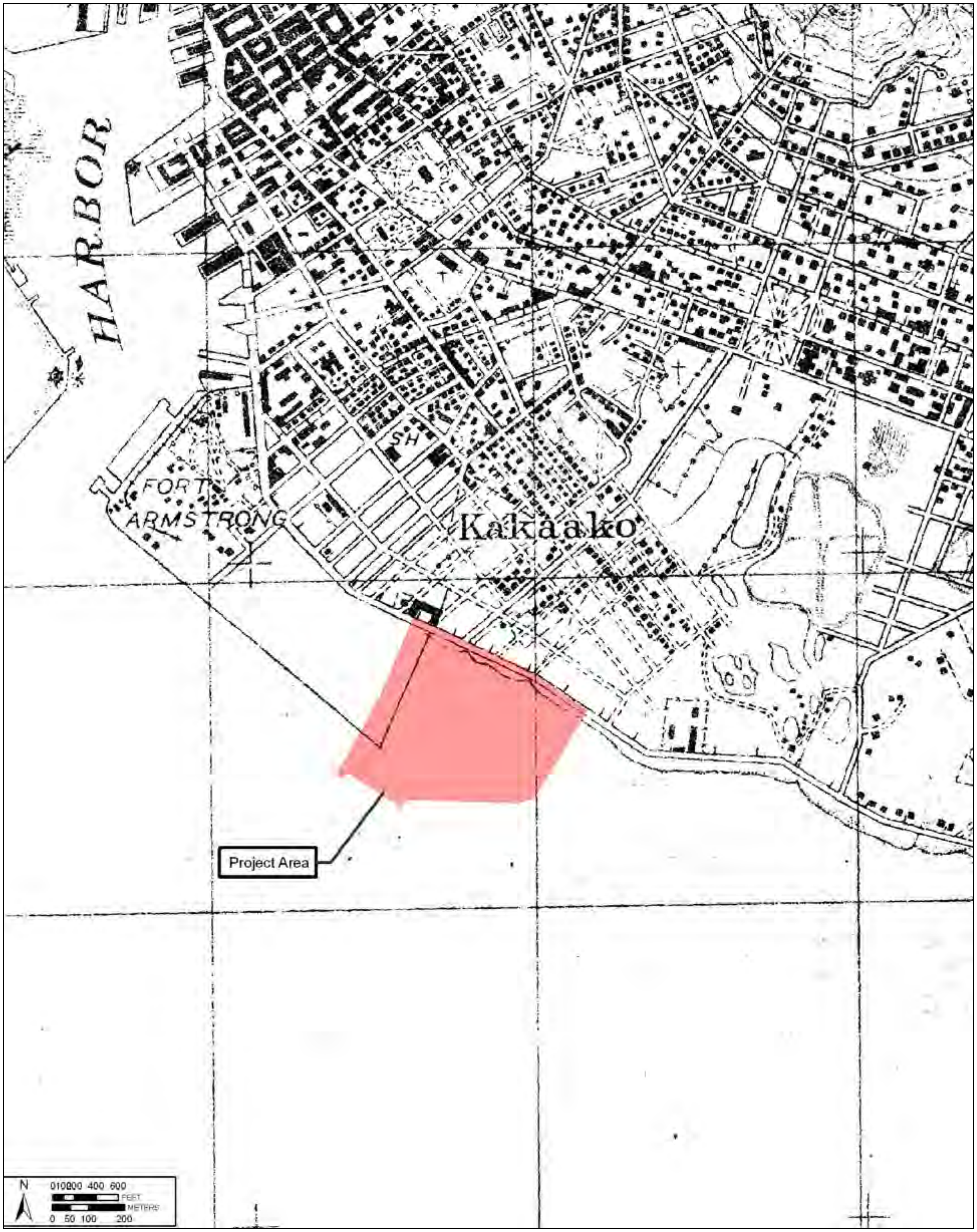

Figure 19. 1919 U. S. Army Fire Control Map, Honolulu Quadrangle, showing study area

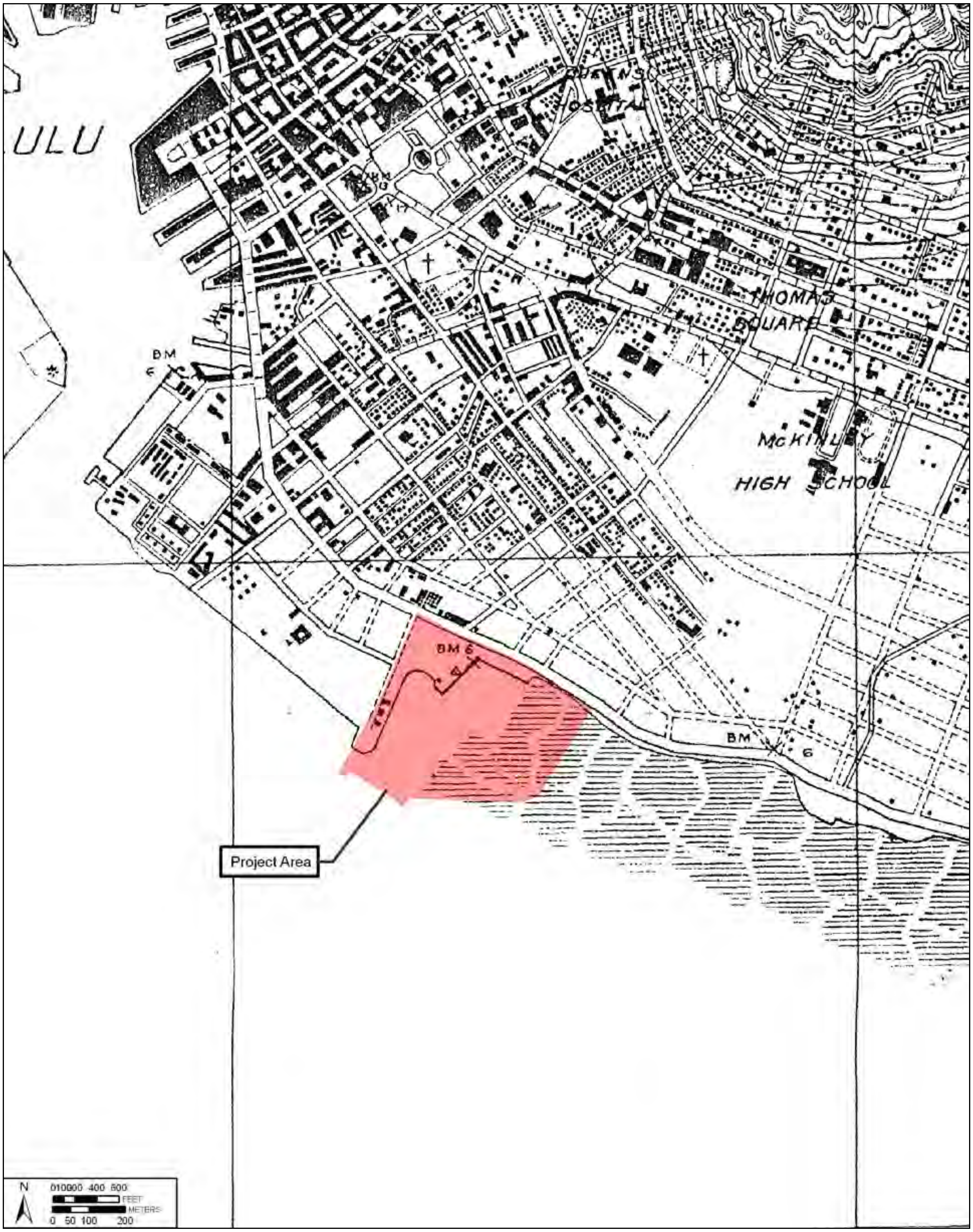

Figure 20. 1927/1928 U.S. Geological Survey Honolulu Quadrangle map, showing study area

Figure 21. 1927 aerial photograph showing the natural deep pocket in the reef (just prior to dredging) and the brand new and in-progress land fill on the west side (note: a very narrow strip of sand is shown between the narrow beach road and the sea most, or all, of which is believed to have been covered by seaward widening of Ala Moana Blvd.)

R. J. Baker

DAY AND NIGHT—A COLUMN OF SMOKE

"The desert waterfront of Honolulu where there is a perpetual volcano," described this forsaken stretch of scrub covered coral wasteland between what would become the Ala Wai and Kewalo Basin. In the center of this desolation stood a refuse dump where, day and night, columns of smoke rose into the Hawaiian sky.

Figure 22. 1921 photograph of a City worker supervising open burning of trash understood as on the west side of Kewalo Basin (Original photograph by Ray Jerome Baker, reprinted in Scott 1968:578)

Archives of Hawaii

AT THE DREDGING STAGE

Ala Moana Park was a vast table of white sand when this view was taken by the Army Air Corps on November 1, 1932, from 2000 feet. The photograph points out the filling accomplished by the Hawaiian Dredging Company. There was now more than a mile long build up of sand from the ocean floor covering the scrub covered salt water marshes. Kewalo Basin appears at the top of the picture with Ala Moana Boulevard snaking along the edge of the old tidal flats. Already completed are the lagoons within the park.

Figure 23. 1932 aerial photograph of the creation of Ala Moana Beach Park in 1932 including the east side of Kewalo Basin from dredge spoils (Original photograph at Hawai‘i State Archives, reprinted in Scott 1968:578)

> In looking ahead into the development of Kewalo Basin, the first structure to be built as funds are made available would be the lumber wharf, and it was considered best to use any available funds for performing as much dredging as possible before this wharf was actually built, so that any blasting would not injure the wharf.
>
> The contract awarded for this work called for the removing of approximately 114,000 cubic yards of material and the dredging of a channel 175 feet wide, 13,070 feet long and 28 feet deep, beginning at the mauka end of the proposed wharf and connecting with a channel previously dredged through the reef. (Hawaii. Governor of Hawaii 1921:60)

The basin was initially made to provide docking for lumber schooners, as the area chosen for the harbor area was adjacent to several lumber yards, but by the time the concrete wharf was completed in 1926, this lumber import business had faded, so the harbor was used mainly by commercial fishermen. The dredged material from the basin was used to fill a portion of the Bishop Estate on the western edge of Waikīkī and some of the Ward Estate in the coastal area east of Ward Avenue (U. S. Department of Interior 1920:52). The first half of the bulkhead on the *mauka* side of the basin was completed in 1928 and the second half in 1934.

A 1927/1928 U.S. Geological Survey map (see Figure 20) shows much of the present Kaka'ako Makai area (seaward of Ala Moana blvd/Nimitz) land filled in west of Kewalo Basin but the fill is so recent that the layout of streets is on-going. Kewalo Basin is in the process of being dredged by this time (see Figure 21) but the east side is still in reef flats. Whereas much of the fill on the Fort Armstrong portion of Kaka'ako Makai is understood to have been relatively clean coral and sand dredge material, much of the fill on the west side of Kewalo Basin is understood to have been from decades of open trash burning (see Figure 22).

The 1943 War Department quad map (Figure 25) shows remarkably little urban development of the Kaka'ako Makai area or the area directly *mauka* of Kewalo Basin in the preceding 15 years (compare with the Figure 20 the 1927/1928 map) but we do see the completion of part of the east side of Kewalo Basin as a result of the creation of Ala Moana Park. Barely discernable on the west side of Kewalo Basin is the City & County incinerator built in 1930 (and replaced in 1946; the surf break is still called "Incinerators"). It is understood that the products from incineration were generally used right there as land fill. The 1943 map shows some harbor development in the form of an access road parallel to, and just seaward of, Ala Moana Boulevard. In 1941, the basin was dredged and expanded to its current 55 acres by the U.S. Navy. In 1951, the bulkhead on the east side was finished and in 1954 the area was paved.

The 1953 quad map (Figure 24) shows a very substantial expansion seaward that had occurred in the previous decade in the area immediately west of Kewalo Basin. This is understood as part of City & County landfill that, while far more sanitary than the open burning of the 1920s, still may have been less than what we would call sanitary today. The surf break "Flies" off the west end of Kaka'ako Waterfront Park is said to have been named by Joe Kuala in 1963 "for all of the flies at the landfill" (Clark 2002:74). Clark (2002:74) relates the surf site "was the home of many aggressive black flies that bit the surfers and fishermen." The 1953 map (Figure 25) also shows what appears to be a sand bar on the seaward side of the circa 1930 dredge channel that

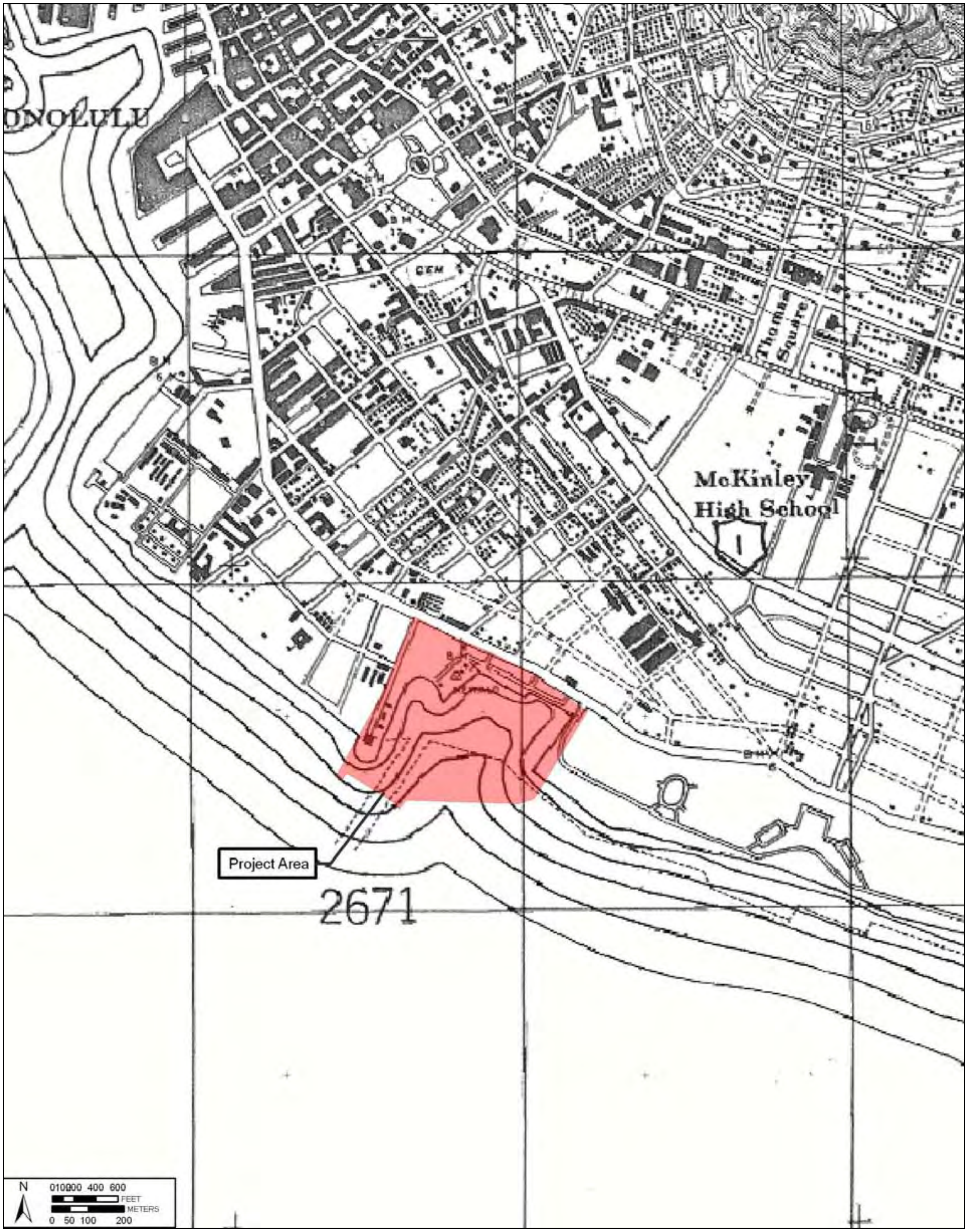

Figure 24. 1943 U. S. War Department map, Honolulu Quadrangle, showing study area

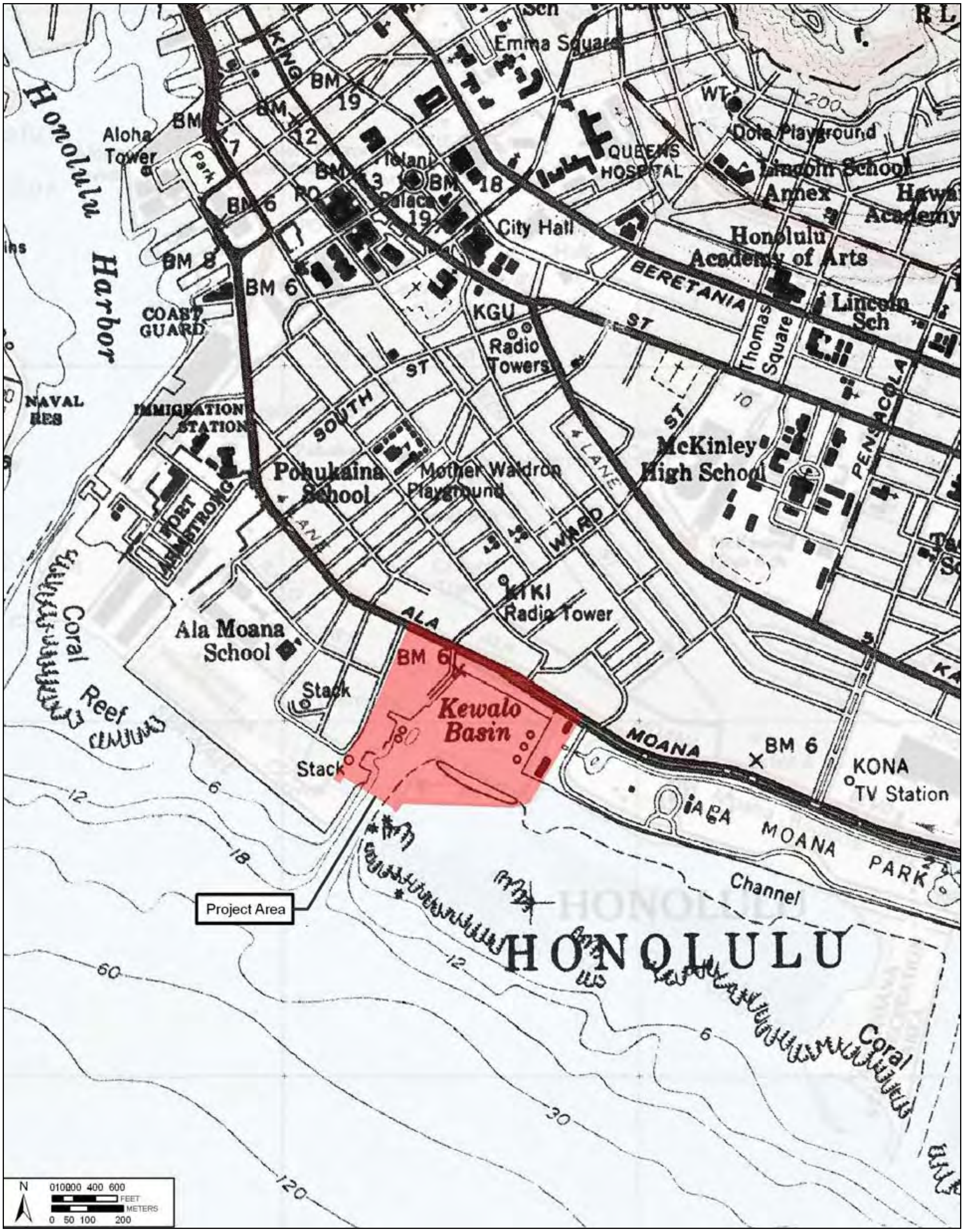

Figure 25. 1953 U.S. Geological Survey map, Honolulu Quadrangle, showing study area

connected Kewalo Basin with the dredged channel fronting Ala Moana Beach Park that closes off much of the seaward side of Kewalo Basin.

This *makai* edge of Kewalo Basin was developed rapidly in the 1953/54 timeframe as a comparison of the 1953 U.S. quad map (See Figure 25) with a 1954 aerial photograph (Figure 26) shows.

The 1956 Army map service Honolulu quad map (Figure 27) shows much the same scene but the recent *makai* addition to the southwest of Kewalo Basin is shown more clearly as still undeveloped. In 1955, dredged material was placed along the *makai* side of Kewalo Basin to form an 8-acre peninsula protected by a rock revetment and the herring-bone shaped pier was completed in 1955.

The 1959 U.S. Geological Survey map (Figure 28) clearly shows that the infilling behind the new (present day) seawall of Kaka‘ako Makai west of Kewalo Basin was actively on-going at statehood. The present land configuration on the southeast side of Kewalo Basin appears to have been completed in the 1956/1959 timeframe with filling in of a portion of the dredge channel that had formerly been continuous from the dredge channel fronting Ala Moana Beach Park to the dredged Kewalo Basin. An access road (the present Kewalo Basin access road) has now been constructed along the east and southeast sides of Kewalo Basin. As late as this 1959 map there is no indication of the landfill seaward of Fort Armstrong having been initiated.

A 1968 aerial photograph (Figure 29) shows much the same situation as the 1959 US Geological Survey quad map (Figure 28) with a few more small building constructions on the east and south sides (housing such institutions as McWayne’s Marine Supply, South Sea Divers and the Sampan Inn restaurant).

In the 1969 Defense Mapping Agency Honolulu quad map (Figure 30) we finally see the landfill configuration of Kaka‘ako Makai and Kewalo Basin extant today (with substantial fill activities having taken place on the seaward side of Fort Armstrong in the 1960s). This late landfill seaward of Fort Armstrong affected the surf:

> …there was another place to surf in Kaka‘ako that we called Armstrong’s. It was in front of Fort Armstrong. The shore there was different too – it was a shallow reef, and there were many military homes on the beach. We surfed in front of the homes. The landfill on the reef that made Piers 1 and 2 destroyed Armstrong’s. (as related by Rawlins “Sonny” Kauhane, in Clark 2002:121).

Additional work completed at Kewalo Basin included an extension of the wharf in 1968 and the construction of a new herringbone pier and additional concrete catwalks in 1969, 1970, 1972, 1974, and 1977 and 1978. In 1986, new catwalks were built to replace the old herringbone pier and other structures. The area and the structures around the basin were renovated in 1988. In 2009, management of Kewalo Basin harbor was transferred from the Department of Transportation (DOT) to the Hawai‘i Community Development Authority (HCDA) (Kewalo Basin Harbor 2009). Ownership was transferred by Act 86 in 1990. The harbor today is mainly used by commercial fishermen and charter boat owners who offer sports fishing, scuba diving, whale watching and local cruise trips to tourists.

Figure 26. 1954 aerial photograph showing seaward portion of Kewalo Basin still under construction

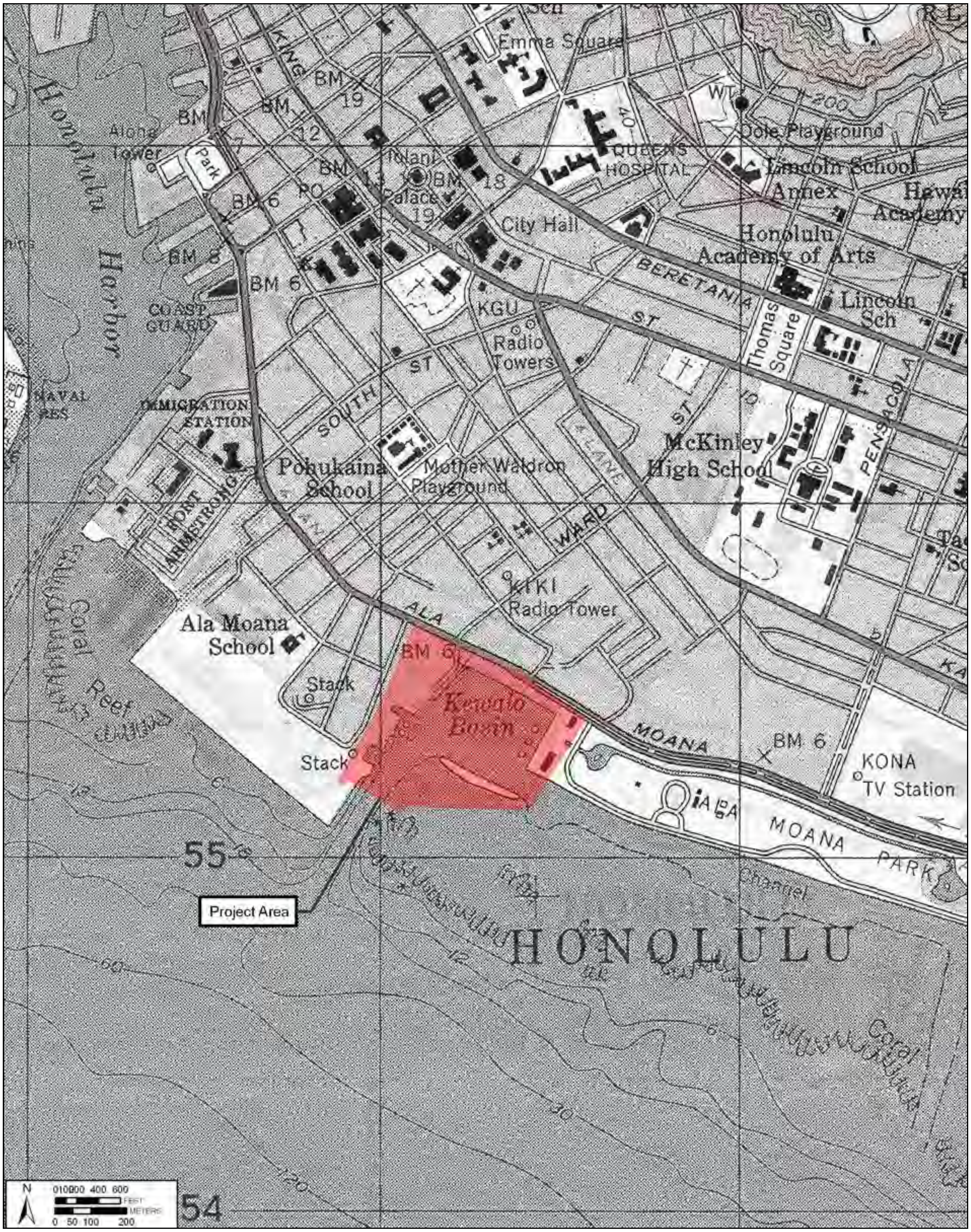

Figure 27. 1956 U.S. Army Map Service, Honolulu Quadrangle, showing study area

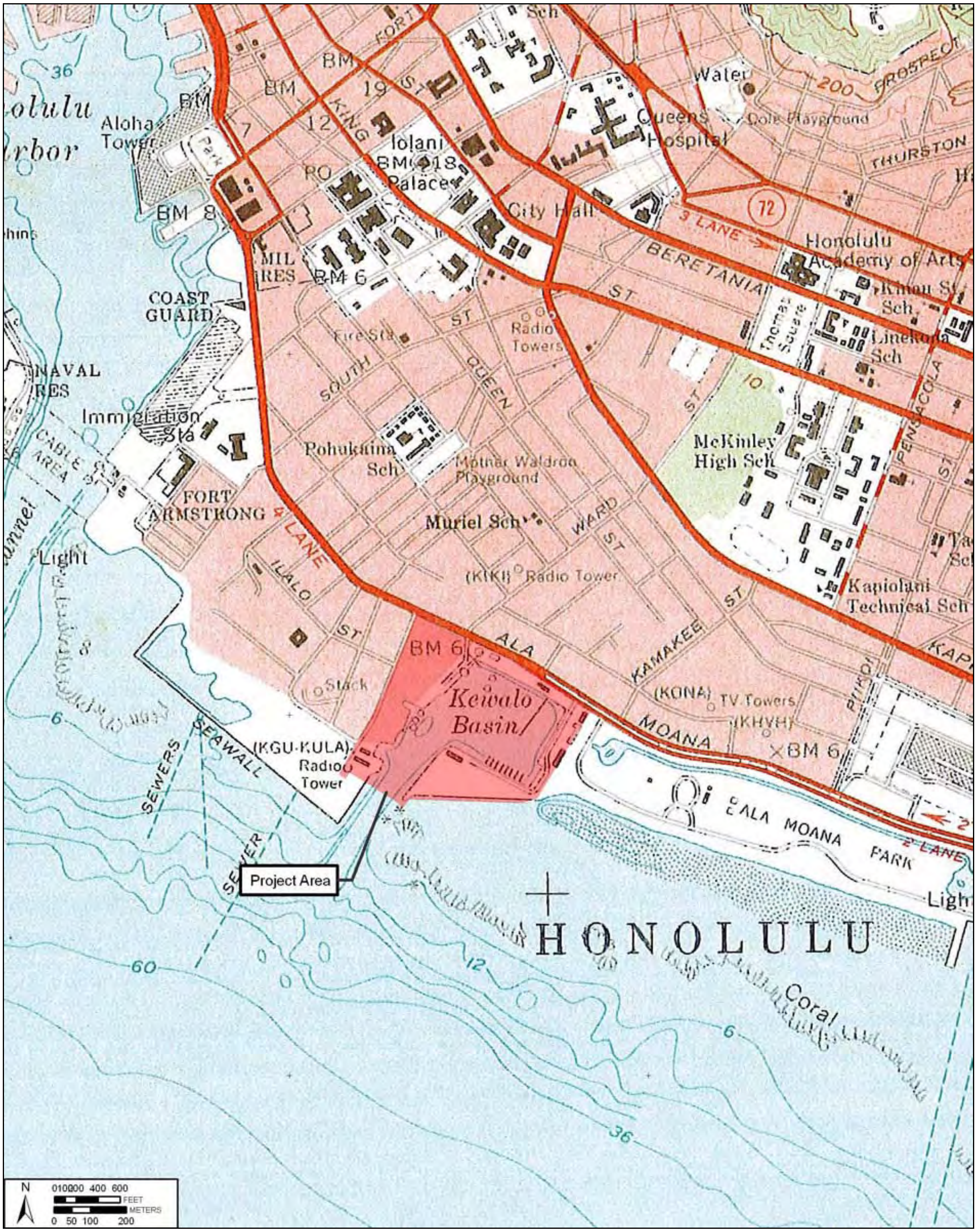

Figure 28. 1959 U.S. Geological Survey, Honolulu quad map (Note: portions of Kaka'ako Makai are still underwater but Kewalo Basin has attained its present configuration)

Figure 29. 1968 aerial photograph mosaic of entry to Kewalo Basin showing land fill at west side of entrance

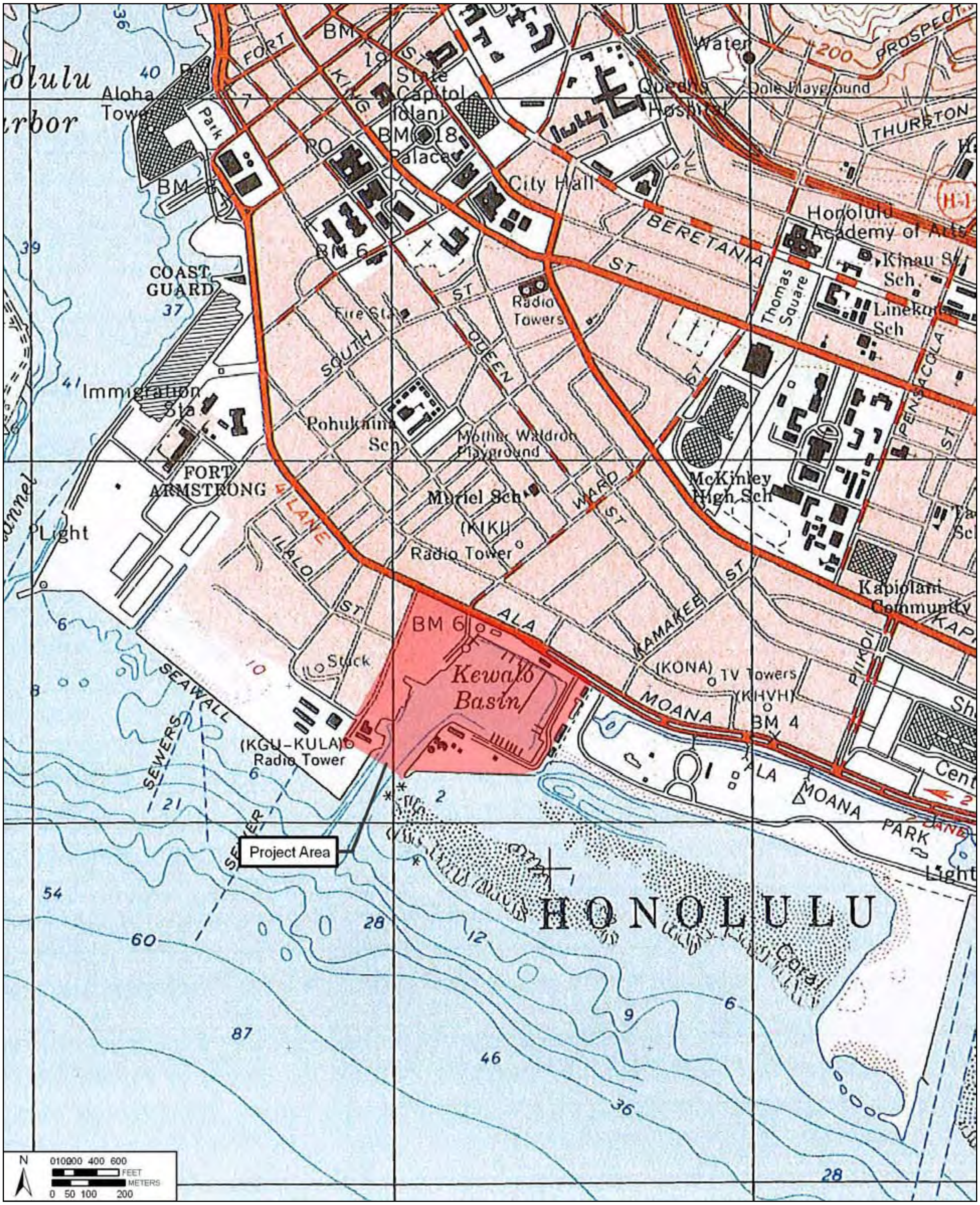

Figure 30. 1969 U.S. Defense Mapping Agency, Honolulu quad map (Note: land fill within the study area was completed in the 1960s)

2.4.2 Kewalo Basin and the Community of Kaka'ako

Although Kewalo Basin was originally constructed as a lumber wharf, this need disappeared by the time of the dredging completion in 1926. Fishermen and their boats were crowded in the harbor near the River Street fishmarkets in Chinatown. In 1929, the government ordered these independent fishermen to relocate to Kewalo Basin, which became of some renown for the colorful "sampan" fleet of Kaka'ako.

In 1916, F. Walter Macfarlane founded a tuna fish canning company, with offices at the corner of Ala Moana and Cooke streets in Kaka'ako. The Macfarlane Tuna Company originally employed 39 Japanese fishermen using two gasoline-powered boats and several sailing sampans. The tuna caught was canned and exported to the mainland United States. The cannery was incorporated as Hawaiian Tuna Packers, Ltd. in 1922, and the cannery moved to Kewalo Basin in 1929. Both island and mainland demand for canned tuna exploded in the 1920s and 1930s, and by 1941, the cannery had a workforce of 500, with tuna provided by 300 fishermen in a fleet of 26 sampans (Figures 31 and 32) (Kimura 1998:110-111).

A tourist guide on Hawai'i, first published in 1937, describes the neighborhood around Kewalo Basin.

> Seaward from South King Street a few blocks Waikiki from Aloha Tower is still another Honolulu. Narrow streets curve down between walls out of King Street, bending back behind Kawaiahao churchyard into a gridiron of cross-streets, still for the most part unpaved. One loses oneself easily in confusing angles and turnings, runs into blind alleys, but eventually wanders out to the broad boulevard, that is the seaward boundary of the district—the curving Ala Moana, "Sea Way," that leads to Waikiki. This huddle of factories, small, dingy stores, and humble homes is Kakaako: a place not mentioned in tourist literature, hidden away behind the more ambitious thoroughfares that border it. Here, if anywhere, dwell the Hawaiians of Honolulu. . . . Here in Kakaako dwell the stevedores and the humble folk of a hundred obscure occupations. Among them are Chinese and Japanese storekeepers, Filipino laborers, and the fishermen who moor their oddly-shaped craft at Kewalo Basin on the edge of the district (Gessler 2007 [1937]:180-181).

These "oddly-shaped craft" were sampans, a traditional Japanese boat built without ribs with pine planks bolted to a frame. The boats had a hull:

> slating off from the bow to a flattened bottome and rounding back to a low square stern. Above the water, the sides slant back downward, rakish, exotic-looking, suggesting piracy in strange seas" (Gessler 2007:183).

The boats were usually painted blue, a lucky color, and fortunately a "cheap" paint color. The first boats were powered with sails, but they were modified with gasoline engines around 1905, and replaced with diesel engines in 1927. In 1937, 65 of the 250 sampan fishermen on O'ahu took their catch of *aku* (skipjack tuna) and *ahi* (yellowfin tuna) to the three-acre Hawaiian Tuna Packers cannery at Kewalo Basin. Others took their catch directly to the fish auction at 'A'ala Market in Chinatown. The life of the independent fishermen selling their catch to the cannery or the Honolulu markets ended in World War II, when the government confiscated the sampan fleet in groundless fear that the mainly Japanese owners would use the boats for spying or sabotage. The blue paint of the sampans were covered with white, and the boats were converted for use as coastal watch vessels. The Japanese were banned from offshore fishing and some of the fishermen were interred in military camps. The U.S. military converted the cannery into an assembly plant for aircraft auxiliary fuel tanks. The days of the independent Japanese tuna fishermen in their sampans never recovered from the World War II confiscations (Van Tilburg 2007:44-45). Wood shortages after the war prevented the construction of new boats, and the cannery reopened at only a quarter of its former capacity (Wisniewski 1984:93). The tuna fish cannery closed in 1985 when the industry became unprofitable (Clark 2007:5).

In 1958, the Honolulu office of the National Fisheries Service, a part of the U.S. Fish and Wildlife Service, rented a portion of the 9-acre peninsula of filled land constructed on the east side of the harbor in 1955. On this ground, they built the Kewalo Research Facility, which had large seawater tanks used to study captive live tuna and to provide information on these fish to the tuna industry and to government departments. Research later expanded to the study of shrimp, lobsters, and other fish and to endangered marine animals, such as the endangered monk seal and the green sea turtle (Brill 1992:1). Other organizations used the area for research in the following years. In 1964, the Look Laboratory of Oceanographic Engineering, opened at Kewalo Basin and in 1971 a three-story laboratory building, the Kewalo Marine Laboratory, was built at the basin for the University of Hawaiʻi Pacific Biomedical Research Center

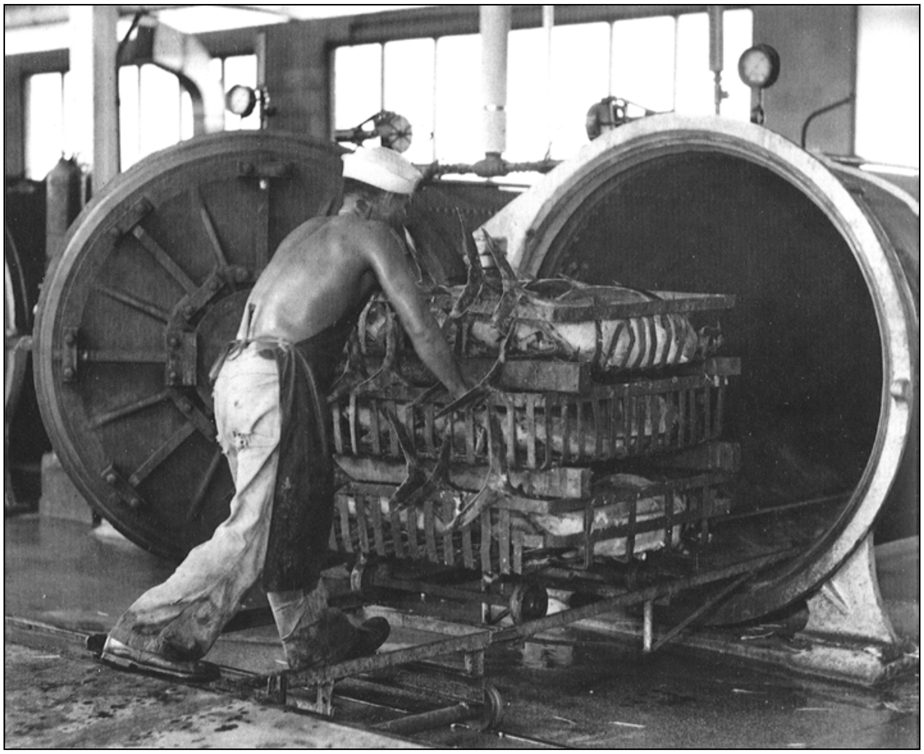

Figure 31. Racks of tuna at Hawaiʻi Tuna Packers Cannery in Kakaʻako c. 1930s (Original photograph at Hawaiʻi State Archives; reprinted in Kapono 2008:138)

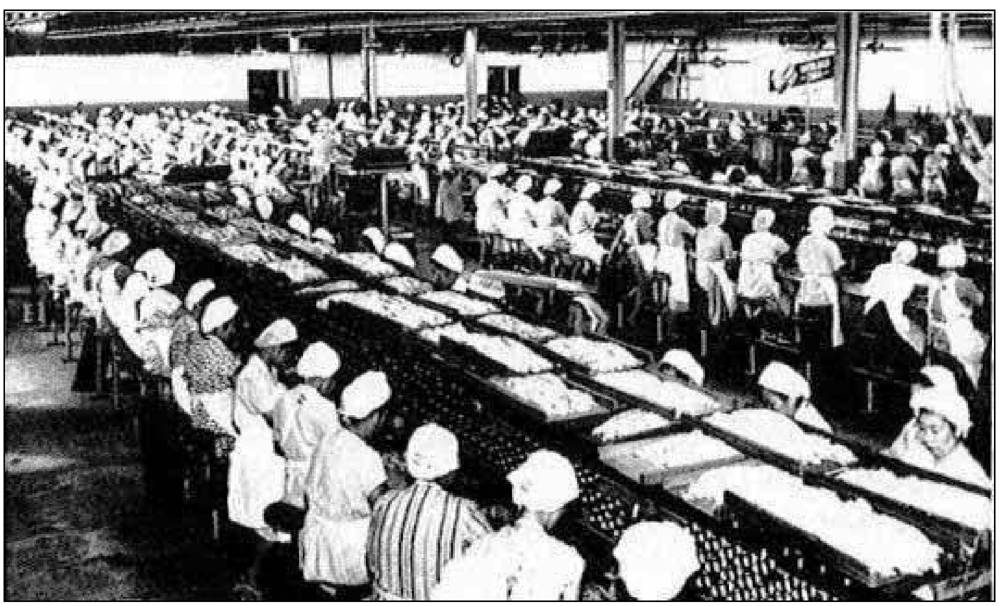

Figure 32. Workers canning fish at the Hawaiʻi Tuna Packers Cannery in Kakaʻako c. 1930s (Original photograph at Hawaiʻi State Archives; reprinted in Wisniewski 1984:93)

Section 3 Results of Field Inspection

The field inspection was carried out in April 2010 on publicly accessible areas of the harbor perimeter by David Shideler. M.A. under the overall supervision of Hallett H. Hammatt Ph.D.

The background research presented here would appear to show beyond a reasonable doubt that the margins of Kewalo Basin seaward of Ala Moana Boulevard were almost entirely created from land fill actions of the twentieth century (with much of the seaward harbor construction post-dating 1953.

The purpose of the field inspection was in part to produce a photograph record (Figures 33 to 40) for possible reference indicating when various portions of the harbor are understood to have been reclaimed by land fill activities.

An area of particular interest is the strip immediately seaward of the seaward curb of Ala Moana Blvd. (for example in the view plane shown in Figure 35) in the present study area. A slight rise is notable moving south from the south curb of Ala Moana Blvd. This is undoubtedly the result of twentieth century fill activities. We understand this area was built up and landscaped when HCDA carried out improvements to Kewalo Basin in 1995. Whether there are any underlying natural sediments above the water table south of the south curb of Ala Moana Blvd. is not certain.

Part of the purpose of the field inspection was to document any matters of historic preservation interest or cultural resource management interest as might be observed.

Recently a statue was erected in the southeast corner of the study area honoring the work of the Blessed Mother Marianne Cope who ran a Kakaʻako Branch Hospital for Hansen's disease patients (see Figure 41) While this seems a completely appropriate place for the honorific statue it should be noted in passing that the Kakaʻako Branch Hospital for Hansen's disease patients was located inland of the present study area in the mid 1880s. While this statue is not a historic property, in any future harbor improvements we would recommend this statue be respected as part of the historic legacy of the area.

Another contemporary sculpture honoring a "*Pueo*" (owl) legend associated with the general Kewalo area (regarding owl legends and Kewalo, see Thrum 1998: 200-202 and Westervelt 1996: 132-135) is located on the east side of the harbor entrance (Figure 42). Again, while this statue is not a historic property, in any future harbor improvements we would recommend this statue be respected as part of the historic and cultural legacy of the area.

The presence of a Kewalo Basin Community Garden showcasing Native Hawaiian plants (associated with the Hālau Kū Māna Public Charter School which appears to be based in a shed near the east harbor entrance) was noted (Figure 43). The Hālau Kū Māna Charter School has been an HCDA tenant since 2006 under a lease for an ancillary school facility. The Native Hawaiian garden was constructed by the Hālau Kū Māna as a condition of their lease to provide educational opportunities for their students and lasting educational value for the patrons of the park. While neither the Hālau Kū Māna Public Charter School nor the associated Kewalo Basin Community Garden are understood as historic properties, we recommend developers be cognizant of their existence.

Kewalo Basin has been associated with a specific and unique type of *aku* fishing since before the creation of the present harbor. The living symbol of this fishery is a specific style of *aku* (skipjack tuna) sampan such as the *Kula Kai* (Figure 44). It is noted that very, very few of these old style sampans remain today. We understand that provision for commercial fishing slips will continue allowing for the possible continuation of this important part of the historic and cultural fabric and legacy of Kewalo Basin.

Figure 33. General view of west side of Kewalo Basin, view to northeast (note the foreground is understood to have been reclaimed circa 1950)

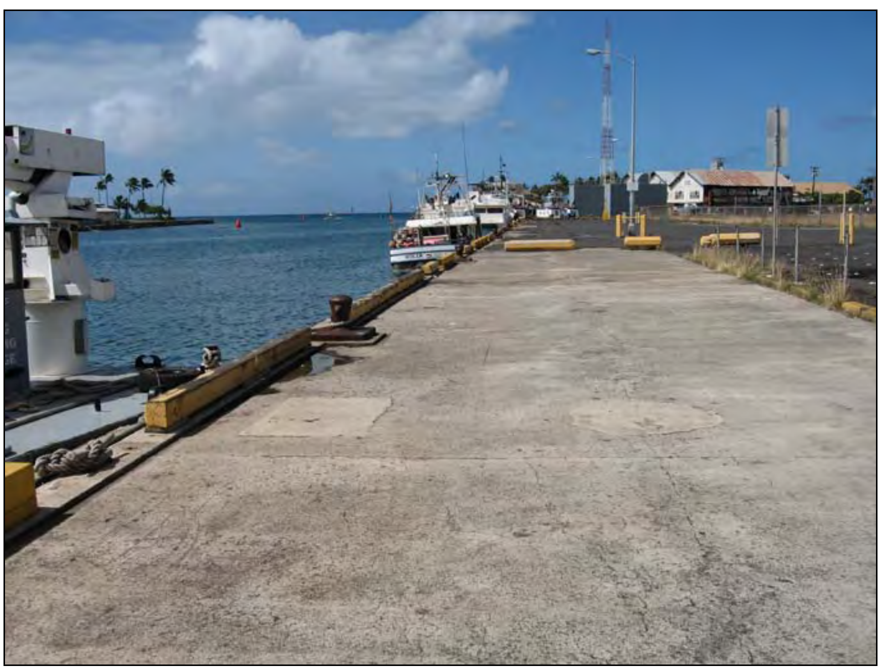

Figure 34. General view of west side of Kewalo Basin, view to southwest (note the foreground is believed to have been reclaimed circa 1927)

Figure 35. General view of Ala Moana Boulevard (at left) side of Kewalo Basin, view to southeast (note: if any native soils lie *makai* of Ala Moana Blvd. they do not extend far to the south)

Figure 36. General view of Ala Moana Boulevard (off photo to right) side of Kewalo Basin, view to northwest (note: it appears unlikely any native soils lie in this field of view)

Figure 37. General view of east side of Kewalo Basin, view to SSW (note: this area is believed to have been reclaimed circa 1943

Figure 38. General view of southeast corner of Kewalo Basin, view to ESE (note: this area is believed to have been dredged circa 1930 and reclaimed circa 1954

Figure 39. General view of the east portion of the south side of Kewalo Basin, view to northwest (note: this area was reclaimed in the late 1950s)

Figure 40. General view of entrance to the NOAA compound at the west portion of the south side of Kewalo Basin, view to northwest (note: this area was reclaimed in the late 1950s)

Figure 41. Contemporary statue honoring the work of the Blessed Marianne Cope who ran a Kakaʻako Branch Hospital for Hansen's disease patients located inland of the present study area in the mid 1880s, view to northwest

Figure 42. Contemporary sculpture honoring "*Pueo*" legend associated with Kewalo, view to northwest

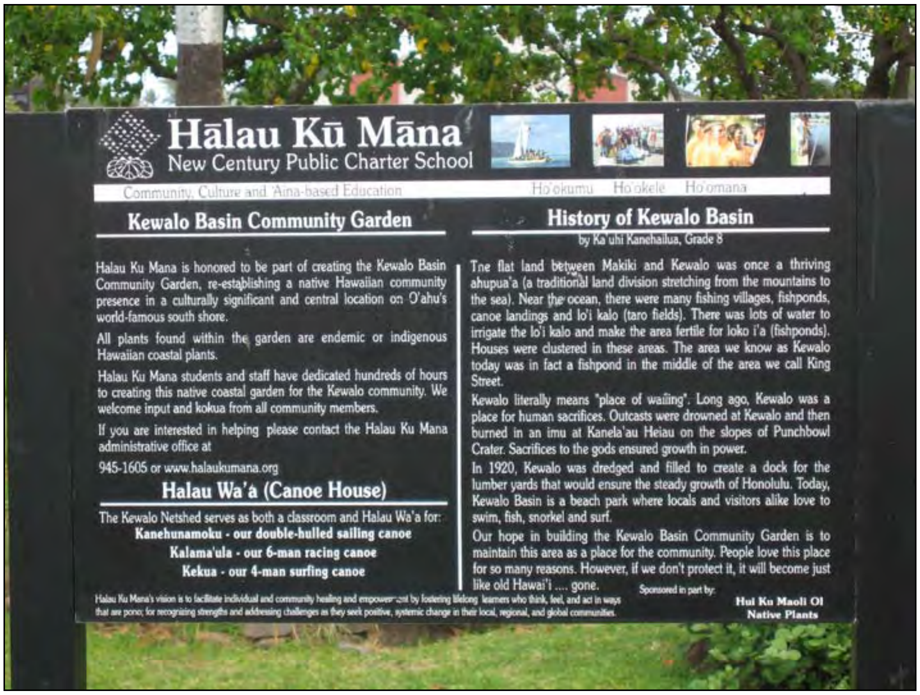

Figure 43. Sign at entrance to Kewalo Basin Community Garden associated with the Hālau Kū Māna Public Charter School based near the south corner of the project area, view to west

Figure 44. The *aku* sampan *Kula Kai* – one of the last old time *aku* (skipjack tuna) boats still operating out of Kewalo Basin

Section 4 An Evaluation of the Archaeological Potential of the Kewalo Basin Area

The previous overview documents in some detail that beyond a reasonable doubt as late as circa 1919 (see Figure 19) almost all of the present Kewalo Basin study area was awash at high tide. As late as 1956 (see Figure 27) large portions of the present study area were still under water. This suggests that no pre-twentieth century in-situ deposits would be expected in 95%+ of the project area. While there could potentially be early twentieth century in-situ deposits (such as trash pits) in the extreme inland portion of the project area adjacent to the *makai* curb of Ala Moana Boulevard (for example in the view plane shown in Figure 35), these would not be anticipated to be major considerations for development. No human burials would be expected anywhere in the project area with the possible exception of the immediate vicinity of the seaward curb of the Ala Moana/Nimitz alignment.

From the first maps of any accuracy in about 1825 (see Figure 6), we see that geo-referencing shows the Ala Moana/Nimitz alignment (typically referred to as the “coast road”) as right on the edge of the sea. We cannot rule out however that there may have been small areas of low-lying sandy land extending just seaward of the Ala Moana/Nimitz alignment. Our overview efforts on a substantial series of historic maps (see Figures 6-9, 11, 12, 16, 19 & 20) suggest that the “Beach Road” alignment was a pre-Contact foot path, and then a horse path, and then a buggy and cart path, and then contemporary Ala Moana Boulevard was built to the edge of the coast at the edge of high water. The extensive fringing reef, awash at low tide for a distance south of many tens of meters provided sufficient protection from high surf for the proto-Ala Moana Blvd. alignment to really hug the sea edge.

On the other hand, our earliest aerial photograph from 1927 (see Figure 21) indicates a narrow strip of sand seaward of the Ala Moana Boulevard alignment that was stable enough to support vegetation.

In this regard, a sketch of “Honolulu Beach” by G. H. Burgess in the mid 1850s (Figure 45) is of note in that it appears to show Hawaiian residences as very close to the coastline – within 10 meters or so. Undoubtedly the wide protective expanse of shallows allowed for permanent habitations much closer to the sea than was generally typical. It should be noted that the scene depicted by Burgess is well west of the present study area and is thought to reflect the high population density of coastal Kou at the time. Just Diamond Head (southeast) of the foreground depicted, the residential pattern is suggested to have been quite different, with a sea change to a very low density of permanent habitations in the marshy salt lands to the east, with the density of habitations then increasing significantly east of the present study area approaching Kālia of Waikīkī. The density of habitations on the coast depicted by Burgess certainly suggests that small areas of coastal habitation (and associated archaeological deposits and/or burials) could have been present near the Ala Moana/Nimitz alignment of the present study area.

Human skeletal remains (SIHP # 50-80-14-6376) were identified just west of Kamake‘e Street on the *mauka* side of Ala Moana Boulevard (Souza et al. 2002). Further finds adjacent to the Ala Moana/Nimitz alignment in the vicinity of the present study area would not be unexpected.

It seems most likely to us that any lands seaward of the old “Beach Road” (that was later widened to create Ala Moana Boulevard) were too close to the water table and too unstable to have been used for permanent habitation or burials. Furthermore it seems most likely to us that as the Beach Road was widened in the twentieth century, to a width perhaps ten-fold the width of the beach road of the early 1800s, that this road widening was in a seaward direction taking advantage of land fill on the seaward side of the Beach Path. So it appears most likely that there are no natural sediments above the water table at all in the project area seaward of the seaward curb of Ala Moana Boulevard. At most, it would appear that natural sediments above the water table seaward of the seaward curb of Ala Moana Boulevard could only extend seaward a distance of ten meters.

Consultation with the State Historic Preservation Division is recommended prior to any substantial ground disturbing activities within 10 m to the south of the south curb of Ala Moana Boulevard.

Figure 45. This sketch of “Honolulu Beach” by G. H. Burgess in the mid 1850s (from Scott 1968:575) portrays a scene just west of the present study area roughly between Pier 5 (foreground) and Fort Armstrong (at extreme right) (Note: the thatched houses are quite dense and are constructed surprisingly close, within 10 m or so, to the high tide line)

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Addendum to:
Kewalo Basin Repairs Project
Archaeological Literature Review
And Field Inspection Report
Kaka‘ako Ahupua‘a, Honolulu (Kona District), O‘ahu
TMK: [1] 2-1-058
Addressing Kewalo Underground Storage Tanks Project

Prepared for

Helber Hastert and Fee Planners

Prepared by

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1.1 Project Background

Cultural Surveys Hawai‘i previously prepared a *Kewalo Basin Repairs Project Archaeological Literature Review and Field Inspection Report Kaka‘ako Ahupua‘a, Honolulu (Kona District), O‘ahu TMK: [1] 2-1-058* (Hammatt and Shideler 2010) study that was reviewed and accepted by the State Historic Preservation Division in a HAR 13-13-276 review dated June 8 2010 (Log No 2010.2065, Doc No. 1006MV20). That review letter well sums up the conclusions from our documentation to the effect that:

> Old maps and aerial photos provided in this document indicate that the land area around Kewalo Basin was constructed from dredging spoils in the 1950’s. Therefore, it makes sense that there are no identifiable archaeological resources within the Kewalo Basin project area…

In consultation with our client, Helber Hastert and Fee Planners and the project proponent, the Hawai‘i Community Development Authority (HCDA), it was agreed that it would be best to have a “paper trail” of consultation with the SHPD regarding an associated Kewalo underground storage tanks (UST) installation project that was not part of the initially provided project description.

According to the designers, the UST’s should be situated as close to the fuel dock as practical, so it’s safe to say that they will be installed *makai* of the Makai Wharf, or specifically within the fill land. The Kewalo underground storage tanks (UST) project is described as follows:

> A dedicated fueling service is not currently available at Kewalo Basin. Present fueling practices involve truck deliveries to the harbor. The fuel trucks have a 100-gallon delivery limit, while some of the commercial vessels have up to 130-gallon fuel tanks on-board (parasail operators). The proposed action includes a dedicated fueling facility to be located on a pier extension at the west end of the Makai Wharf. Both diesel and gasoline would be available at the fuel dock. The fueling dock would be constructed in a later, yet unfunded construction phase (5-10 years after initial phase).
>
> Fuel storage tanks will be installed in the adjacent onshore area on fill land. A conservative estimate of tank capacity is 30,000 gallons (e.g., 20,000 gallons of gasoline for commercial operators and 10,000 gallons of gasoline for pleasure craft). These tanks will likely be located underground for protection from storms and vandalism, and to reduce visual impacts. A 15,000- to 20,000-gallon tank would be approximately 10 ft deep by 50 ft long. The ultimate location of the tanks will be determined by proximity to the fuel dock, tanker truck route, tanker truck parking for off-loading fuel, and location of existing underground utilities.

The general location of the proposed UST installation project is shown on the following Figures 1 and 2.

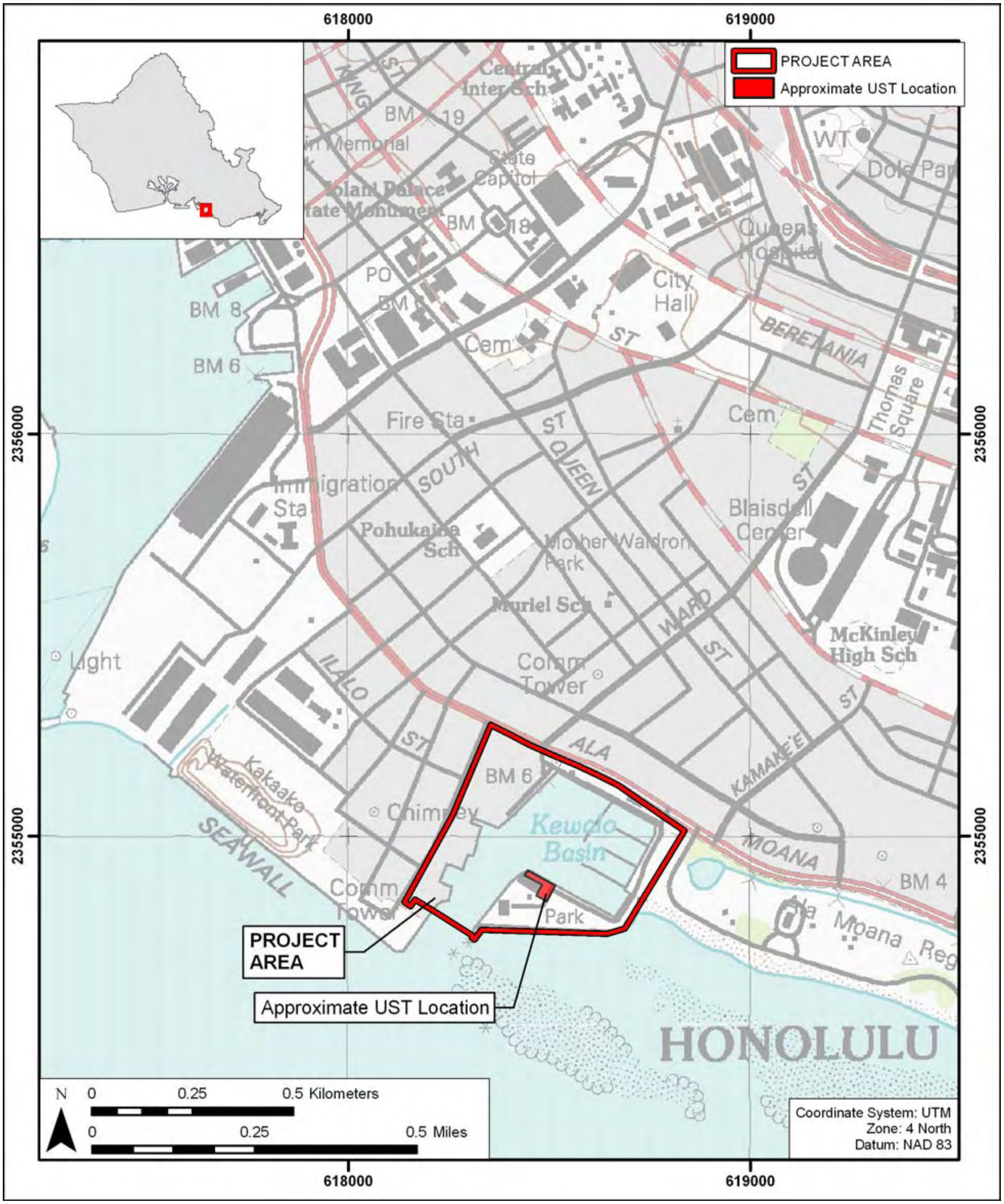

Figure 1. Portion of U.S. Geological Survey 7.5 Minute Series Topographical Map, Honolulu Quadrangle 1998, showing location of study area

Figure 2. Aerial Photograph showing study area (U.S. Geological Survey Orthoimagery 2005)

1.2 Documentation of Creation of Land in 1953/1954 and Absence of Archaeological Concerns

We just wanted to provide the SHPD with evidence that the proposed UST installation project area was:

- Open water in 1943 (see Figure 3)
- Undergoing initial land creation in 1953 (see Figure 4)
- Was newly created land in 1954 (see Figure 4).

Thus this appears to be a straight-forward matter that the Kewalo UST installation project involves no concerns for adverse impacts to any historic properties and that no further archaeological work is necessary for the Kewalo UST installation project.

We seek a brief memo from the SHPD agreeing with this recommendation.

Mahalo for your consideration of this matter. Please feel free to call David Shideler at Cultural Surveys Hawaiʻi (tel. 262-9972) if you have any questions.

Aloha.

David Shideler

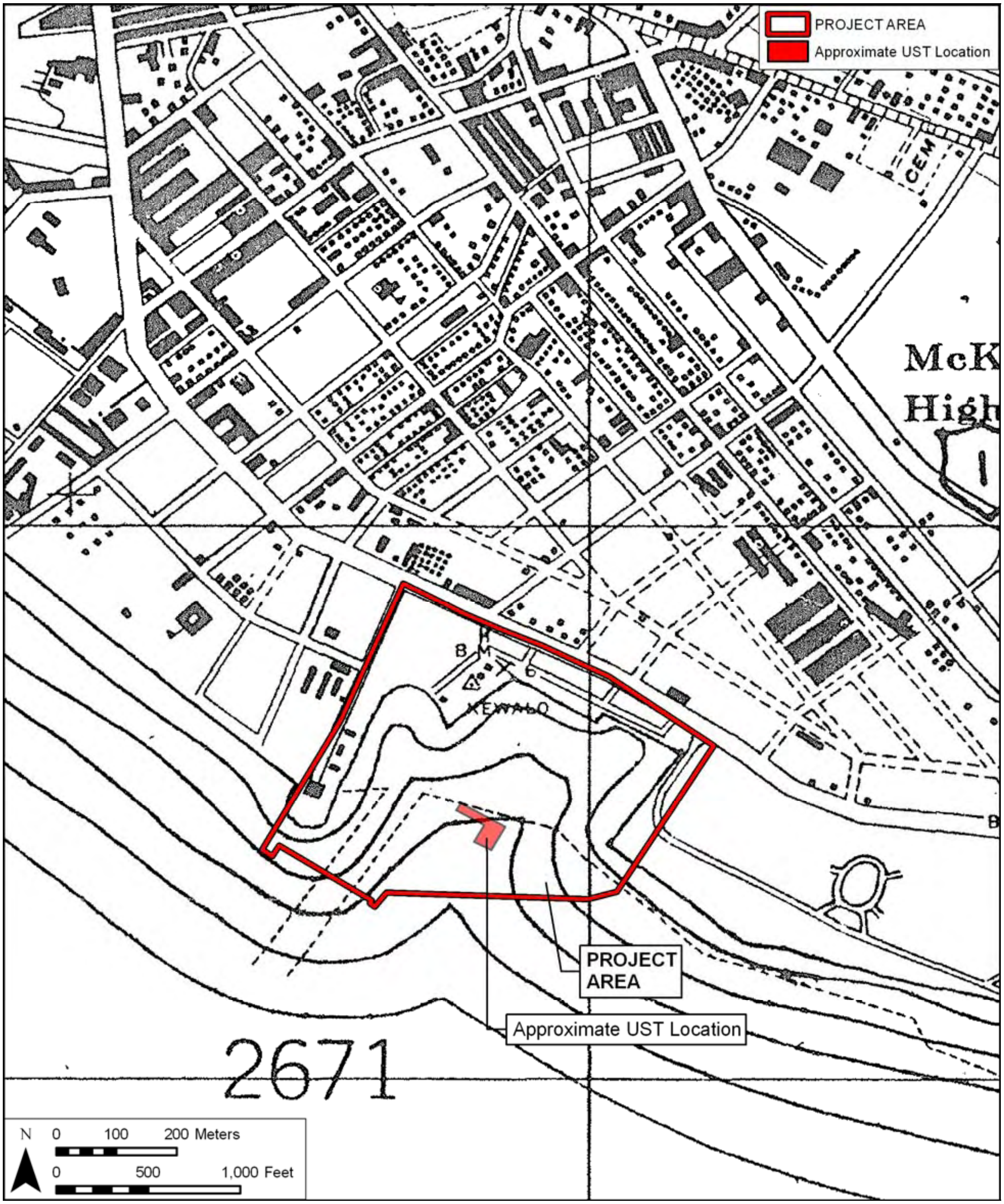

Figure 3. 1943 U. S. War Department map, Honolulu Quadrangle, showing study area

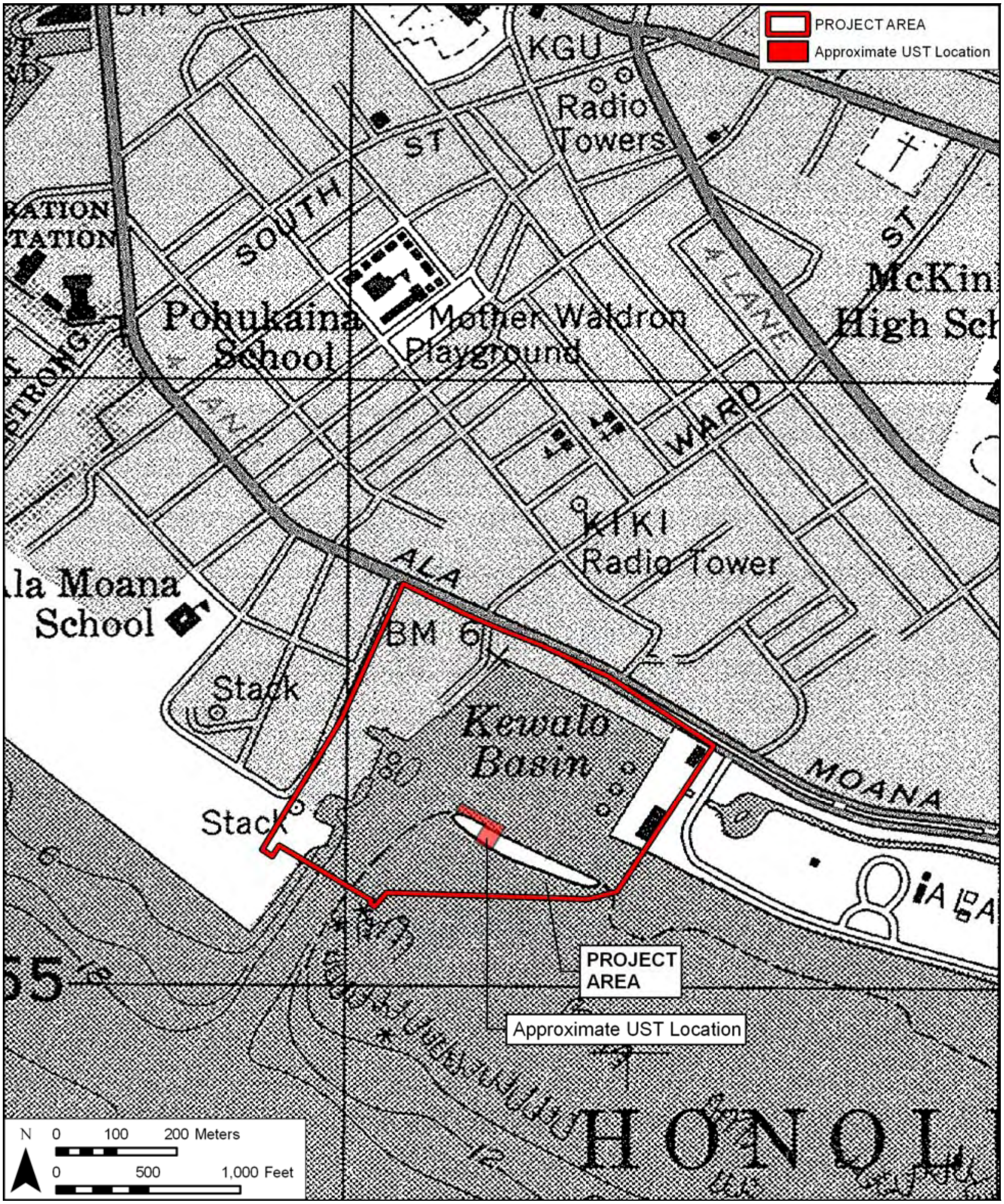

Figure 4. 1953 U.S. Army Map Service, Honolulu Quadrangle, showing study area

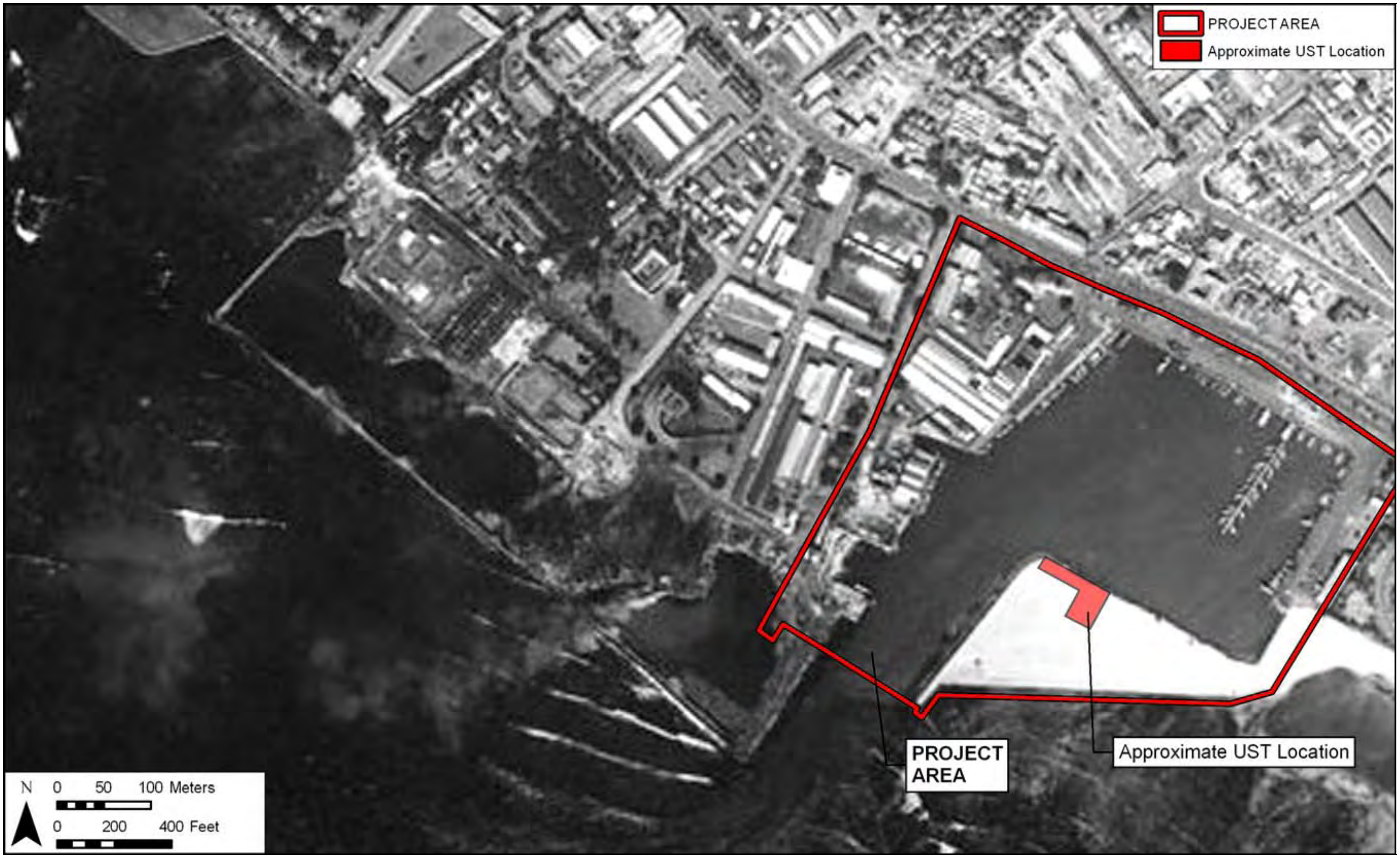

Figure 5. 1954 aerial photograph showing seaward portion of Kewalo Basin still under construction

Cover photo courtesy of Almar Management

G
Cultural Impact Assessment

Cultural Impact Assessment for the Kewalo Basin Repairs Project, Kaka‘ako Ahupua‘a, Honolulu (Kona District), O‘ahu

TMK: [1] 2-1-058

Prepared for

Helber Hastert & Fee, Planners

Prepared by

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Prefatory Remarks on Language and Style

A Note about Hawaiian and other non-English Words:

Cultural Surveys Hawaiʻi (CSH) recognizes that the Hawaiian language is an official language of the State of Hawaiʻi, it is important to daily life, and using it is essential to conveying a sense of place and identity. In consideration of a broad range of readers, CSH follows the conventional use of italics to identify and highlight all non-English (i.e., Hawaiian and foreign language) words in this report unless citing from a previous document that does not italicize them. CSH parenthetically translates or defines in the text the non-English words at first mention, and the commonly-used non-English words and their translations are also listed in the *Glossary* (Appendix A) for reference. However, translations of Hawaiian and other non-English words for plants and animals mentioned by community participants are referenced separately (see explanation below).

A Note about Plant and Animal Names:

When community participants mention specific plants and animals by Hawaiian, other non-English, or common names, CSH provides their possible scientific names (Genus and species) in the *Common and Scientific Names of Plants and Animals Mentioned by Community Participants* (Appendix B). CSH derives these possible names from authoritative sources, but since the community participants only name the organisms and do not taxonomically identify them, CSH cannot positively ascertain their scientific identifications. CSH does not attempt in this report to verify the possible scientific names of plants and animals in previously published documents; however, citations of previously published works that include both common and scientific names of plants and animals appear as in the original texts.

Abbreviations

APE	Area of Potential Effect
CIA	Cultural Impact Assessment
CSH	Cultural Surveys Hawaiʻi
DOH/OEQC	Department of Health/Office of Environmental Quality Control
FAD	Fish Aggregating Device
HAR	Hawaiʻi Administrative Rules
HCDA	Hawaiʻi Community Development Authority
HRS	Hawaiʻi Revised Statutes
KCDD	Kakaʻako Community Development District
LCA	Land Commission Award
OHA	Office of Hawaiian Affairs
OIBC	Oʻahu Island Burial Council
SIHP	State Inventory of Historic Properties
SHPD	State Historic Preservation Division
TCP	Traditional Cultural Property
TMK	Tax Map Key
UH	University of Hawaiʻi
USGS	United States Geological Survey

Management Summary

Reference	Cultural Impact Assessment (CIA) for the Kewalo Basin Repairs Project, Kaka‘ako Ahupua‘a, Honolulu (Kona District), Island of O‘ahu, TMK: [1] 2-1-058 (Genz and Hammatt 2010)
Date	August 2010
Project Number	CSH (Cultural Surveys Hawai‘i) Job Code: KAKAAKO 25
Agencies	State of Hawai‘i Department of Health/Office of Environmental Quality Control (DOH/OEQC)
Project Location	The study area is Kewalo Basin and immediately adjacent lands located in central coastal Honolulu on the central eastern portion of the south shore of O‘ahu.
Land Jurisdiction	Hawai‘i Community Development Authority (HCDA)
Project Description	The HCDA proposes the repair and/or replacement of the existing mooring infrastructure at Kewalo Basin to modernize the facilities, increase its small craft moorage capacity, and improve operational efficiencies. Kewalo Basin currently provides 143 slips and 9,170 lineal feet of moorage. Much of the existing mooring infrastructure is aging and in disrepair. The proposed full build-out includes the demolition and replacement of all existing in-water piers and slips in the harbor, and reconfiguration of piers and slips to optimize mooring capacity. At full build-out, the Project will increase the number of slips by about 75% and the total linear moorage capacity by about 45%. All in-water work would take place within the existing harbor boundaries. No changes to existing bulkheads (wharves) are planned, except to improve existing utilities serving the piers. Shore side work would be limited to some localized utility trenching that may be necessary to tie-in to the existing utilities; however, these are expected to be limited to the areas directly adjacent to the existing piers. An alternative is in-kind replacement of existing piers—i.e., replacing the piers and in-water infrastructure, but retaining the same slip capacity in the same configurations. However, this is not the preferred alternative as it does not provide long-term modernization of the harbor.
Project Acreage	22 acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this CIA, the APE is defined as the approximately 22-acre Project area. While this investigation focused on the Project APE, the study area included the entire area of Kaka‘ako.
Document Purpose	The Project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed project’s effect on cultural practices and resources. Helber Hastert & Fee, Planners requested CSH to conduct this CIA. Through document research and ongoing cultural consultation efforts, this report provides

	information pertinent to the assessment of the proposed Projects' impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*) which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawaiʻi State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria according to Hawaiʻi Administrative Rules (HAR) §13–275 under Criterion E. The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E and HAR Chapter 13–275.
Consultation Effort	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the Project area and the vicinity. Outreach included efforts to contact 39 individuals and agencies. The organizations consulted included the State Historic Preservation Division (SHPD), the Office of Hawaiian Affairs (OHA), the Oʻahu Island Burial Council (OIBC), Hui Mālama I Nā Kūpuna ʻO Hawaiʻi Nei, the Honolulu Hawaiian Civic Club, Friends of Kewalos, Hālau Kū Māna, and community members of Kakaʻako.
Results of Background research	Background research for this Project yielded the following results (presented in approximate chronological order): 1. The location and extent of the area called Kakaʻako is ambiguous. The modern urban district of Kakaʻako is comprised of the *ʻili* (land section) of Kakaʻako and other lands once part of the extant *ahupuaʻa* (land division usually extending from the uplands to the sea) of Honolulu. 2. The Kakaʻako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation; however, the fill has served as an agency of preservation rather than destruction of the patterns of early Hawaiian life and the remains of nineteenth century Honolulu and Waikīkī (Griffin et al. 1987:73). Much of the *wahi pana* (storied places), *loko iʻa* (fishponds), *heiau* (shrines), and other cultural resources, and natural deposits and land forms of the area have survived below this fill. Accompanying *moʻolelo* (stories, oral traditions), *oli* (chants), *ʻōlelo noʻeau* (proverbs), and *wānana* (prophecies) have been documented that still resonate with Hawaiians of the Kakaʻako district today. 3. The *ʻili* of Kakaʻako and surrounding lands remained outside the two most intensely populated and cultivated areas on southeastern Oʻahu—Waikīkī and Honolulu—during pre-

	Contact times, yet Hawaiians used the lowland marshes, wetlands, salt pans, and coral reef flats for salt making and farming of fishponds along with some limited wetland taro agriculture (Kotzebue 1817), and this supported habitation sites clustered around the *mauka* (inland) boundary of the Kakaʻako area near Queen and King Streets (LaPasse 1855). 4. The salt marshes were excellent places to gather pili grass for the thatching of houses, which may have led to the name Kakaʻako (prepare the thatching) (Thrum 1922:639). *Moʻolelo* point to the coastal marshes of Kewalo as the habitat of the original *pueo* (owl) that became one of the Hawaiians' *ʻaumākua* (deified ancestors) (Westervelt 1963:135–137; Thrum 1998:200–202). The *moʻolelo* of Kawaiahaʻo follows a trail between Waikīkī and Honolulu to locate two freshwater springs—Kewalo Spring and Kawaiahaʻo (The Waters of Haʻo) (Pukui 1988:87–89), which highlights its location between the two main population centers. 5. Kewalo was once associated with a spring called Kawailumalumai (drowning waters, Sterling and Summers 1978:292) that was used to sacrifice *kauwā*, or members of a pariah caste, designed for the *heiau* of Kānelāʻau on the slopes of Pūowaina (Punchbowl) as the first step in a drowning ritual known as Kānāwai Kaiheheʻe (Kamakau 1991:6) or Ke-kai-heʻeheʻe (sea sliding along) (Westervelt 1963:16). 6. Puʻukea Heiau (white hill), which belonged to the chief Huanuikalalaʻilaʻi, was possibly located on one of the few elevated locations in the flat, low-lying swamp that surrounded it. *Kāhuna* (priests) used *mahiki* (a kind of grass) of Puʻukea, which grew on the nearby coast, to exorcise malicious spirits from the afflicted (Pukui and Elbert 1986:219), a concept that still resonates with the contemporary usage of *mahiki* in lines of *hoʻoponopono* (family conference in which relationships are set right) inquiry to "peel off" layers of deeper feelings (Pukui et al. 1972:228). 7. Land Commission Award (LCA) documents reveal that much of the land in Kakaʻako was used to produce salt, including: salt ponds near the shore that filled with salt water at high tide (*ālia*), drains where the salt water from these pans was transferred to smaller clay-lined or leaf-lined channels (*hoʻoliu*), natural depressions in the rocks along the shore where salt formed naturally (*poho kai*), and land (*kula*) that could probably not be used for agriculture as it was impregnated with salt (LCA 1903). The abundance of salt led to

	the Kaka‘ako Salt Works in the late nineteenth century (Hustace 2000:50). 8. The Kaka‘ako area continued to remain outside Waikīkī and Honolulu during the post-Contact era. It served as a place of the dying and the dead, of isolation and quarantine, of trash and wastelands, and the poor and the immigrant; however, it also represents the birth of modern Waikīkī and Honolulu (Griffin et al. 1987:73). Specifically in this area: victims of the 1853 smallpox epidemic were quarantined in a camp (Thrum 1897:98) and those that did not survive were buried at Honuakaha Cemetery (Griffin et al. 1987:13); Hansen's Disease patients were treated in the Kaka‘ako Leper Branch Hospital (Griffin et al. 1987:55); victims of the 1895 cholera epidemic were treated at the Kaka‘ako Hospital (Thrum 1897:101); infected patients of the 1899 bubonic plague were moved to a quarantine camp; animals were quarantined in a station in 1905; and the city's garbage was burned in an incinerator at Kewalo Basin (UH 1978). 9. After the annexation of the Hawaiian Islands by the United States in 1898, the U.S. Congress began to plan for the coastal defenses of their new islands, which included Fort Armstrong on the Ka‘ākaukukui Reef as a station for the storage of underwater mines. In 1911, the Honolulu Rifle Association, and possibly other groups, used the flat, uninhabited Kaka‘ako lands near the coast as a rifle range (Williford and McGovern 2003:15). 10. The late nineteenth and early twentieth centuries were a time of intense development of the coasts of Honolulu, Kaka‘ako, and Waikīkī. A number of land reclamation projects dredged offshore areas to deepen and create boat harbors, and used the dredged material to fill in the former swampy land. Kaka‘ako became a prime spot for large industrial complexes, such as iron works, lumber yards, and draying companies (Nakamura 1979). 11. Kewalo Basin harbor was formerly a shallow reef that enclosed a deep section of water that had been used as a canoe landing since pre-Contact times and probably was used since the early historic period as an anchorage. Dredging of the Kewalo Channel began in 1924, but by the time the concrete wharf was completed in 1926, the lumber import business had faded, so the harbor was used mainly by commercial fishermen. In 1941, the government dredged and expanded the basin to its current 22 acres. In 1955, workers placed the dredged material along

	the *makai* (seaward) side to form an eight-acre land section protected by a revetment—now the Kewalo Basin Park (Kewalo Basin Harbor 2009). 12. In 1899, Gorokichi Nakasugi, a Japanese shipwright, brought a traditional Japanese sailing vessel, called a *sampan*, to Hawaiʻi, and this led to a unique class of vessels and distinctive maritime culture associated with the rise of the commercial fishing industry in Hawaiʻi (Van Tilburg 2007). Japanese-trained shipwrights adapted the original *sampan* design to the rough waters of the Hawaiian Islands (Krauss 2006). The fishermen used a traditional live bait, pole-and-line method of fishing and unloaded their catches of *aku* (bonito, skipjack) and *ahi* (yellow-fin tuna) at Kewalo Basin (Van Tilburg 2007:43). The *sampan aku* fleet relocated to Kewalo Basin by 1930, and the McFarlane Tuna Company (now Hawaiian Tuna Packers) built a shipyard there in 1929 and a new tuna cannery at the basin in 1933 (Clark 1977:64). The *sampan* fishing industry declined dramatically following World War II, such that today the *Kula Kai*, built in 1947, is the only surviving vintage wooden *sampan* in Hawaiʻi (Krauss 2006). 13. Previous oral histories of Kakaʻako residents documented the lives of the “unsung heroes” of Kakaʻako from the early twentieth century—the machinists, firemen, cannery workers, and others from diverse ethnic backgrounds that shaped the history of Hawaiʻi (UH 1978). Many of the interviewees were of Japanese descent, and many of their fathers were fishermen who settled in Kakaʻako to have access to the waterfront. Usaburo Katamoto, a boat builder, described 35-foot *aku sampan* “sailing in the fair wind” off the Kewalo Basin harbor and Pearl Harbor, and that he used to dray the newly built vessels with a team of a dozen mules (UH 1978:534-632). Keisuke Masuda, a foreman at Hawaiian Tuna Packers, described in detail how at night he and a small crew of transient Filipinos unloaded the fish from the *sampan*, weighed the fish, operated the boiler, and steamed the fish, and how 200 Japanese women cleaned the fish and packaged the canned tuna (UH 1978:817-876). 14. As a result of the dredging, no pre-twentieth century burials or other pre-twentieth century finds would be expected in the immediate vicinity of the harbor, and there is no documented evidence from archaeological surveys, historical records, or oral traditions of *ilina* (graves) or *iwi kūpuna* (ancestral remains) within the Project area. However, the adjacent lands

	of Kakaʻako contain two large cemeteries and numerous burials, and human skeletal remains were discovered near the former coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamakeʻe Street (Souza et al. 2002). Further, the original foot path at the edge of the former coastline has been transformed through time to a horse path, buggy and cart path, and finally to the widened Ala Moana Boulevard. As a result, early twentieth century human burials and other cultural resources could potentially be located adjacent to the *makai* curb of Ala Moana Boulevard, but any lands seaward of the old trail were probably too close to the water table and too unstable to have been used for permanent habitation or burials (Hammatt and Shideler 2010). 15. During the first half of the twentieth century, the marshlands and rice fields in the Kakaʻako district were filled to accommodate the expanding urbanization of Honolulu. Poverty-stricken settlements arose in the 1920s, camps of Hawaiians, Portuguese, Chinese, and Japanese settlers developed in the 1930s, and the area became increasingly industrial in the 1940s. In the 1960s, the explosive growth of surfing in Waikīkī forced many surfers to explore and discover uncrowded breaks, including the waters of Ala Moana Beach Park and Kewalo Basin (Clark 1977:64).
Results of Community Consultation	CSH attempted to contact 39 community members, government agency and community organization representatives, and individuals, including residents, cultural and lineal descendants, and cultural practitioners. Of the 16 people that responded, six *kūpuna* (elders) and/or *kamaʻāina* (Native-born) participated in formal interviews for more in-depth contributions to the CIA. This community consultation indicates: 1. *Wahi pana* and *moʻolelo* associated with the Project vicinity reveal a strong connection to past traditions and a renewed salience of those traditions today. Mr. Kapanui explains that Hawaiians traditionally dedicated newly constructed *heiau* to the war god Kū and other primary male gods and christened special events with human sacrifices. He shares a *moʻolelo* of sacrificial drowning at the waters of Kewalo Basin and an inland pond located at the Blaisdell Center, a story that Mr. Kapanui uses today to enrapture visitors. According to Mr. Kapanui, *aliʻi* (chiefs) associated with two sacrificial *heiau*—Kānelāʻau Heiau on the slopes of Punchbowl Crater and a *heiau* near the former coastline at the Kawaiahaʻo Church—required that members of the low *kauwā* caste were strangled

underwater to ensure the victim's body remained intact without excessive blood and bruises.

2. The identity of the descendents of former Kakaʻako residents is influenced by *moʻolelo* of the area as a place of coral flats, landfill, dumps, disease, and death. Mr. Kapanui describes how the smallpox epidemic of 1853 ravaged Hawaiʻi. According to Mr. Kapanui, over 3,000 small pox victims were buried in mass graves near the former coastline at Restaurant Row and the old Kakaʻako Fire Station. Older firemen have shared with Mr. Kapanui their experiences of ghost haunting there.
3. *Kamaʻāina* of Kakaʻako fondly reminisce about the diverse ethnic neighborhoods of Kakaʻako and the recreational use of the waterfront during the 1930s and 1940s. A confidential participant portrays the vibrant and interactive character of the Japanese, Chinese, Filipino, and Portuguese immigrant families. Mrs. Kekina remembers swimming in the harbor and cove of Kewalo Basin and nearby reefs.
4. Despite intense dredging and land reclamation in Kakaʻako, knowledge of *lāʻau lapaʻau* (traditional plant medicine) and customs of gathering plants for medicinal and agricultural purposes continue to be passed on by Hawaiians of Kakaʻako. A confidential participant explains in detail the collection, preparation, and medicinal uses of the following plants: *ʻuhaloa*, castor beans, guava, *pōpolo*, *tī*, and *māmaki*, as well as the gathering and consumption of several types of *limu* (seaweed), including *limu ʻeleʻele*, *limu ogo*, and a type of *limu* that grows on *ʻopihi* (limpets) (see Appendix B for common and scientific plant and animal names mentioned by community participants).
5. The historic era of *aku* fishing and *sampan* of Kewalo Basin still resonates with community members today. Mrs. Kekina gives a voice to the few remaining descendents of the original Japanese immigrant fishermen of the early twentieth century. Her father worked as the shipyard foreman for Hawaiian Tuna Packers and built *sampan* boats for *aku* fishing. Mr. Moses describes the small, vibrant community of *aku sampan* fishermen in the late 1960s. The crew regularly gathered on the shore of the harbor on the present-day eastern parking lot and later in a small building near the harbor entrance (now used by the charter school Hālau Kū Māna) to repair their nets, which reached lengths of 200-300 yards. Several fishermen continue to practice the swiftly declining unique maritime tradition of *aku sampan* fishing. Mr. Nihoa and Mr. Moses describe the

	unique specificity of the Japanese-designed *sampan aku* boats and detail the techniques of *aku* fishing. 6. The waters of Kewalo Basin once contained numerous reef fish. Mrs. Kekina fished at the Kewalo Cove for menpachi, which her mother then cooked for an exceptional recipe of miso soup and a confidential participant caught several reef fish at Kewalo Basin, including *ʻāweoweo, manini, ʻōpelu, āholehole, ʻamaʻama*, and squid (octopus). 7. According to Mr. Iwami, the charter school Hālau Kū Māna leases the old net house at the Kewalo Basin Park and maintains a garden near the harbor channel of at least 13 native Hawaiian plant species. (See Section 9.2 for Hawaiian and scientific names of these plants as they appear on labeled signs). 8. Traditional Hawaiian culinary practices live on for *kamaʻāina* of Kakaʻako. A confidential participant explains the preparation of pigs and fish for *lūʻau* (feasts). In addition, Mr. Nihoa and Mr. Moses continue the practice of drying *aku* at sea for home consumption. The boat they work on is evidence of the continued consumption of fresh *aku* as well. 9. A tight-knit intense social community of surfers has emerged at "Kewalos," a series of four surf breaks adjacent to the harbor entrance in front of the Kewalo Basin Park. Mr. Iwami describes the meanings of the surf breaks (Marine Land, Straight Outs, Rennicks/Right Next, and the Point), as well as the neighboring body surfing break located west of the harbor channel in front of the Kakaʻako Waterfront Park (Point Panic). Mr. Iwami suggests that the excellent surfing conditions, the short section of oceanfront land, and the single entrance to the park have contributed to the enduring social bonds of the Kewalos surfers. 10. The respondents are not aware of any cultural or historic properties, including *ilina* or *iwi kūpuna*, within or adjacent to the current Project area. However, Mr. Moses and Mr. Nihoa highlight the cultural significance of the *Kula Kai*, the last of the original wooden *sampan aku* boats in Hawaiʻi which was built just after World War II and is docked at Kewalo Basin.
Summary of Community Recommendations	Based on the community consultations, there are six major concerns regarding potential adverse impacts on cultural, historic and natural resources, practices, and beliefs as a result of the proposed Project (presented in alphabetical order):

	1. **Accessibility**. Ms. Cayan and Mr. Iwami recommend that public access to the Kewalo Basin Park, shoreline, and ocean should not be blocked during construction and that alternatives for access, including adequate parking stalls, become available. Ms. Stevens also feels that the harbor needs more visibility. She does not want the view from Ala Moana blocked, and suggests that buses remain off-site and that rental cars have free parking. 2. **Cultural Preservation**. Several respondents articulate their concerns for the preservation of cultural practices, resources, and artifacts. Ms. Stevens calls for the preservation of the historic *aku* fishing. She specifically suggests discounting the *aku* fishermen's mooring fees and offering tours to preserve the history of *aku* fishing in Hawaiʻi. Mr. Moses and Mr. Nihoa highlight the cultural significance of the *Kula Kai* as the last vintage Hawaiian wooden *sampan aku* boat. Ms. Stevens also calls for the preservation of the tourism based businesses, including parasail, party boat, and sport fishing, and the Kewalo Keiki Fishing Conservancy. 3. **Pollution**. Mr. Nāmuʻo (representing the Office of Hawaiian Affairs), Mr. Iwami (representing Friends of Kewalos), and Mr. Kapanui are concerned with controlling the marine debris, pollutants, and other foreign matter that endanger or harm marine resources, water quality, and the fragile Hawaiian ecosystems. Specifically, Mr. Iwami suggests that toxic and hazardous substances generated during the construction phase could flow out to the nearby fishing and surfing areas, including the surf spots on the Diamond Head side and the ʻEwa side of the harbor channel, and that the addition of slips means that more boats can potentially leak more hazardous materials into the ocean. Mr. Nāmuʻo stresses that the reefs and marine life found within the near- and off-shore waters are not merely resources, but are the foundation of life to Hawaiians. 4. **Slips**. Mr. Moses and Mr. Nihoa are concerned about the maneuverability of their vessel, the *Kula Kai*. As the last vintage wooden *sampan aku* boat, the *Kula Kai* is powered by a single prop, which creates a very slow turning radius for the length of the hull. To leave the harbor, the *Kula Kai*, which is docked near the entrance to the harbor, must slowly and carefully reverse out of its slip so as to not hit the nearby vessels docked on the opposite slip. The distance to the next slip is barely longer that the 89 feet of the *Kula Kai* itself, so Mr. Nihoa must repeatedly reverse and move forward in small turning increments to safely pilot the *Kula Kai* out of its slip.

	Based on this established pattern of leaving the slip, Mr. Moses is concerned that the addition of slips and accompanying vessels will further diminish the maneuverability of the *Kula Kai* at the harbor, which, in turn, could affect its capacity to leave the harbor and make a profit at *aku* fishing. In addition, Ms. Stevens recommends not developing Kewalo Basin as a "mega yacht" harbor, as it is too far and too expensive for these type of yachts to come in large numbers to Hawaiʻi. She suggests that only five to ten berths be set aside for transient yacht type vessels of 75-150 feet in length, as they desire shore power, security and privacy. 5. **Surfing**. Mr. Iwami and Mr. Young are concerned that the Project may impact surfing at "Kewalos." Increasing the number of slips from 143 to 250 will drastically increase the amount of boats going in and out of the channel. This may form a chop that ruins the surfing waves and increases the chance of accidents. In addition, Mr. Iwami does not want to see any changes to the harbor channel, such as dredging to widen the channel, as this will directly impact the recreational usage of the area. 6. **Tourism**. Ms. Stevens suggests borrowing ideas from the Fishing Village at Pier 38 to better attract locals and tourists. Ms. Stevens lists seven specific ways for the harbor to become more attractive: create a historical marker on the Trolley Tour, including the 100 year history of the Hawaiian Tuna Packers cannery; promote the sport fishing business while giving clients the option to keep the fish they catch; stop the wedding chapels on the western side of the harbor; maintain the John Dominus restaurant; beautify the adjacent road with landscaping; reduce the feral cat population; and relocate the homeless.
Project Impacts	Based on the information gathered from archival documents, archaeological research, and community consultation detailed in the CIA report, CSH has determined that there are no direct impacts of the Project on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes. There are, however, three potential indirect cultural impacts: 1. The landscape surrounding Kewalo Basin contains four cultural and historic features, including a statue at the harbor entrance that enshrines the *pueo* as the protector of the Kakaʻako area; an honorific statue of the Blessed Mother Marianne Cope for her historic efforts in battling Hansen's disease; a Native Hawaiian garden of Hālau Kū Māna with its numerous

	medicinal and agricultural plants; and the net house, a structure originally designed for the repair of the *aku sampan* fishermen's *nehu* nets. According to Helber Hastert & Fee, Planners, the Project will not extend to land uses other than utility improvements at the wharfside. However, Project construction may indirectly impact any cultural activities associated with Hālau Kū Māna, which is located adjacent to the Project area. Based on a CSH site visit and discussions with Mr. Iwami, this charter school centers on cultural education, including the construction of outrigger paddling canoes and the maintenance of the Native Hawaiian garden. Construction-related noise may adversely affect these and other cultural practices and any associated religious activities (e.g. prayers). 2. Cultural and recreational activities, such as surfing, paddling, and fishing, occur in the near-shore waters outside of Kewalo Basin. If the Project construction or operation results in adverse water quality impacts that extend outside the harbor, there may be impacts to these activities. According to Helber Hastert & Fee, Planners, marine resources and water quality studies are now being prepared and will evaluate potential impacts of the construction and increased slip count on the marine environment, and address mitigation measures if appropriate. 3. Kewalo Basin harbors the *Kula Kai*, the last vintage example of a unique class of maritime vessel and type of fishing (*aku sampan*). According to Helber Hastert & Fee, Planners, the Project has been designed to accommodate all existing harbor users, including the *Kula Kai*. However, construction-related impacts may affect the maneuverability of the vessel to leave the harbor in the short-term, which, in turn, could affect its long-term sustainability. Mr. Moses and Mr. Nihoa specifically state that the single prop of the *Kula Kai* forces a very wide turning radius for the extreme length of the hull. Water-based construction (e.g. barges) of the slips near the *Kula Kai* may further diminish the space for its maneuverability, and any addition of nearby slips and accompanying vessels may continue to diminish the long-term maneuverability of the *Kula Kai*.
Overall Recommendations	Based on the information gathered from archival documents, archaeological research, and community consultation detailed in the CIA report, CSH recommends the following four measures for the proposed Project to mitigate potentially adverse effects on cultural, historic and natural resources, practices, and beliefs: 1. Land-disturbing activities at the wharf near Ala Moana

	Boulevard—the former coastline—may uncover burials or other cultural resources. Should cultural or burial sites be identified during ground disturbance, all work should immediately cease and the appropriate agencies notified pursuant to applicable law. 2. Community members and organizations should be briefed and consulted as the Project design progresses. This will keep them informed of any changes that could result in unanticipated adverse cultural impacts. In particular, Mr. Moses and Mr. Nihoa represent a sharply declining number of *aku* fishermen with mastery of the traditional methods of fishing and knowledge of *aku sampan*. As such, they can be considered living human treasures of the distinctive Hawaiian *aku sampan* culture and could be utilized as expert community consultants. According to Helber Hastert & Fee, Planners, the *Kula Kai* has a representative on the Kewalo Basin Stakeholders Advisory Group, which has been briefed several times on the proposal, and will continue to be briefed as the design progresses. 3. Protect the Native Hawaiian garden and cultural activities of Hālau Kū Māna from construction-related debris and activity during Project construction. 4. Implement best management practices to reduce or avoid impacts of the construction and increased slip count on the marine environment and nearby water-based recreational and cultural activities, such as surfing at the four “Kewalos” surf breaks.

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Section 1 Introduction

1.1 Project Background

At the request of Helber Hastert & Fee, Planners, Cultural Surveys Hawaiʻi, Inc. (CSH) conducted a Cultural Impact Assessment (CIA) of approximately 22 acres for the Kewalo Basin Repairs Project, Kakaʻako Ahupuaʻa, Honolulu (Kona District), Island of Oʻahu, TMK: [1] 2-1-058 (Figure 1 to Figure 3). The Hawaiʻi Community Development Authority (HCDA) proposes the repair and/or replacement of the existing mooring infrastructure at Kewalo Basin to modernize the facilities, increase its small craft moorage capacity, and improve operational efficiencies. Kewalo Basin currently provides 143 slips and 9,170 lineal feet of moorage. Much of the existing mooring infrastructure is aging and in disrepair. The proposed full build-out includes the demolition and replacement of all existing in-water piers and slips in the harbor, and reconfiguration of piers and slips to optimize mooring capacity. At full build-out, the Project will increase the number of slips by about 75% and the total linear moorage capacity by about 45%. All in-water work would take place within the existing harbor boundaries. No changes to existing bulkheads (wharves) are planned, except to improve existing utilities serving the piers. Shore side work would be limited to some localized utility trenching that may be necessary to tie-in to the existing utilities; however, these are expected to be limited to the areas directly adjacent to the existing piers. An alternative is in-kind replacement of existing piers—i.e., replacing the piers and in-water infrastructure, but retaining the same slip capacity in the same configurations. However, this is not the preferred alternative as it does not provide long-term modernization of the harbor.

In addition to the CIA, CSH also conducted a literature review and field inspection for the Project area. The results of this archaeological study are presented in a companion report titled *Kewalo Basin Repairs Project Archaeological Literature Review and Field Inspection Report Kakaʻako Ahupuaʻa, Honolulu (Kona District), Oʻahu TMK: [1] 2-1-058* (Hammatt and Shideler 2010) (see Section 6.4).

Figure 1. Portion of the orthoimagery of the 2005 Honolulu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle showing the Project area

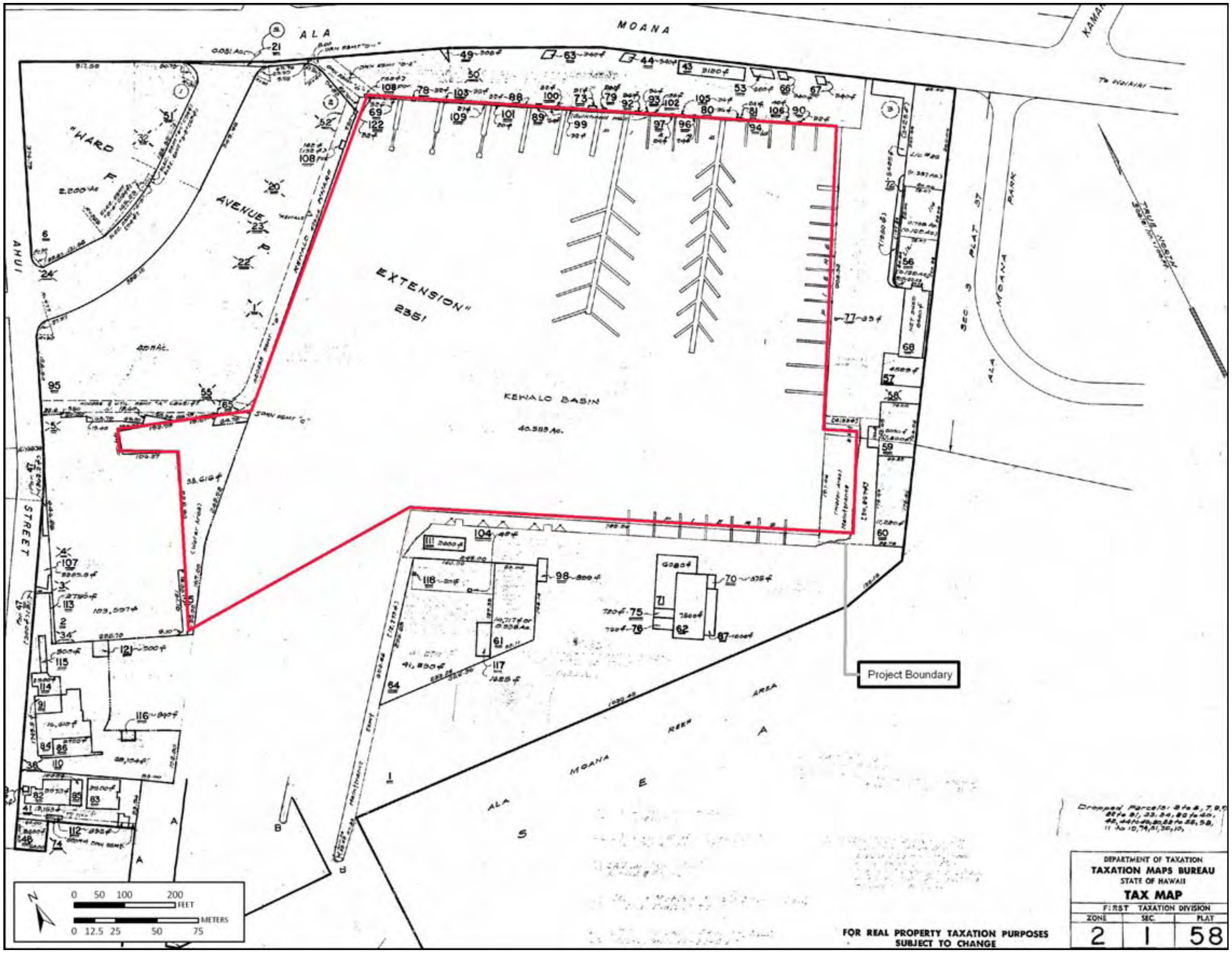


Figure 2. TMK: [1] 2-1-058 showing Project area (Hawaiʻi Tax Map Key Service 2010)

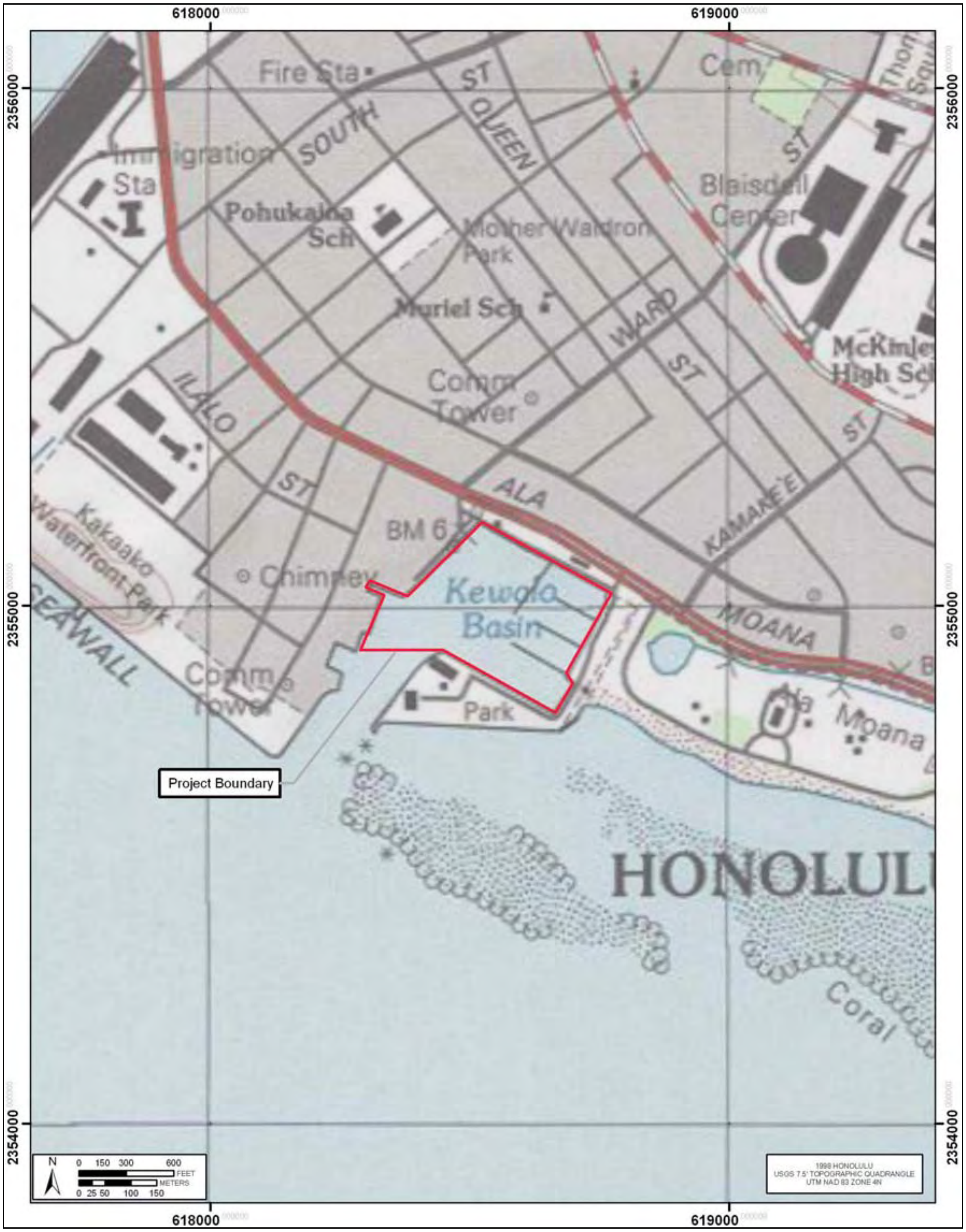


Figure 3. Portion of the 1998 Honolulu USGS 7.5 minute topographic quadrangle showing the Project area

1.2 Document Purpose

The Project requires compliance with the State of Hawaiʻi environmental review process (Hawaiʻi Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed project's effect on cultural practices. CSH is conducting this CIA at the request of Helber Hastert &Fee, Planners. Through document research and ongoing cultural consultation efforts, this report provides information pertinent to the assessment of the proposed Project's impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*). The impacts may include Traditional Cultural Properties (TCPs) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places. In accordance with Hawaiʻi State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria in the Hawaiʻi Administrative Rules (HAR) §13–275 under Criterion E, an historic property determined to be significant shall:

> Have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E and HAR Chapter 13–275.

1.3 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Land Divisions

Hawaiians recognize several land divisions in varying scales, including the *moku* (district), the *kalana* (smaller land division than *moku*), the *ahupuaʻa* (land division usually extending from the uplands to the sea), and the *ʻili* (subdivision of an *ahupuaʻa*) (Malo 1951:16). S.K. Kuhano wrote in 1873 (cited in Kameʻeleihiwa 1992:330) that Oʻahu was divided into six *kalana* (although later scholars refer to these same divisions as *moku*)—Kona, ʻEwa, Waiʻanae, Waialua, Koʻolau Loa and Koʻolau Poko—that were further divided into 86 *ahupuaʻa* (Figure 4). The *ahupuaʻa* of southeastern Oʻahu within the traditional *moku* of Kona (more recently referred to as the *moku* of Honolulu) once extended from the Koʻolau mountain range on the *mauka* (inland) side to the shoreline on the *makai* (seaward) side. Due to the growth of the settlements of Honolulu and Waikīkī in the late pre-Contact (pre-1778) period and early post-Contact periods, the seaward sections of many *ahupuaʻa* were cut off from the sea. The government later subdivided sections of Honolulu and Waikīkī into neighborhoods or districts, including Kakaʻako, which the Hawaiʻi HCDA recently named the Kakaʻako Community Development District (KCDD).

The original location and extent of the area called Kakaʻako is ambiguous. In mid-nineteenth-century documents and maps, Kakaʻako was a small *ʻili* within the *ahupuaʻa* of Honolulu. The ethnographer Henry Kekahuna (1958:4), who was born in Hawaiʻi in 1891 and was a long-time resident of Honolulu, placed it "on the Ewa side of Kuloloia Stream where the Honolulu Iron Works and Fort Armstrong are now," an area currently covered by One Waterfront Plaza (between South and Punchbowl Streets). F.S. Dodge (1891) placed Kakaʻako between Punchbowl Street, Pohukaina Street, South Street, and Ala Moana Boulevard, C.J. Lyons (1876) drew a point marked Kakaʻako further east between Cooke Street, ʻOhe Lane, and Ala Moana Boulevard, and Sereno Bishop (1884) does not show an area named Kakaʻako (Figure 5).

The modern urban Kakaʻako district is comprised of the *ʻili* of Kakaʻako and lands once known as Kaʻākaukukui, Kukuluāeʻo, and Kewalo (see Figure 5), and even smaller areas—portions of *ʻili*—called Kawaiahaʻo, Honuakaha, Kaʻalaʻa, ʻĀpua, ʻAuwaiolimu, Pualoalo, Puʻunui, and Kolowalu. The current district known as Kakaʻako is significantly larger than the traditional area of the same name. It includes the area *makai* of King Street from South Street to Kalākaua Avenue/Ala Wai Boulevard. Complicating the historic and contemporary boundaries of the area called Kakaʻako is the fact that many sources, including CSH reports, conventionally refer to Kakaʻako as its own *ahupuaʻa*.

In sum, the area called Kakaʻako can variously be referred to as a traditional *ʻili*, a historical district (not to be confused with a *moku*), and a modern *ahupuaʻa*. While the title of the CIA report reflects the conventional naming of Kakaʻako as an *ahupuaʻa*, the body of the report tries to reflect its other traditional and historic boundaries as appropriate through the use of the terms *ʻili* and district.

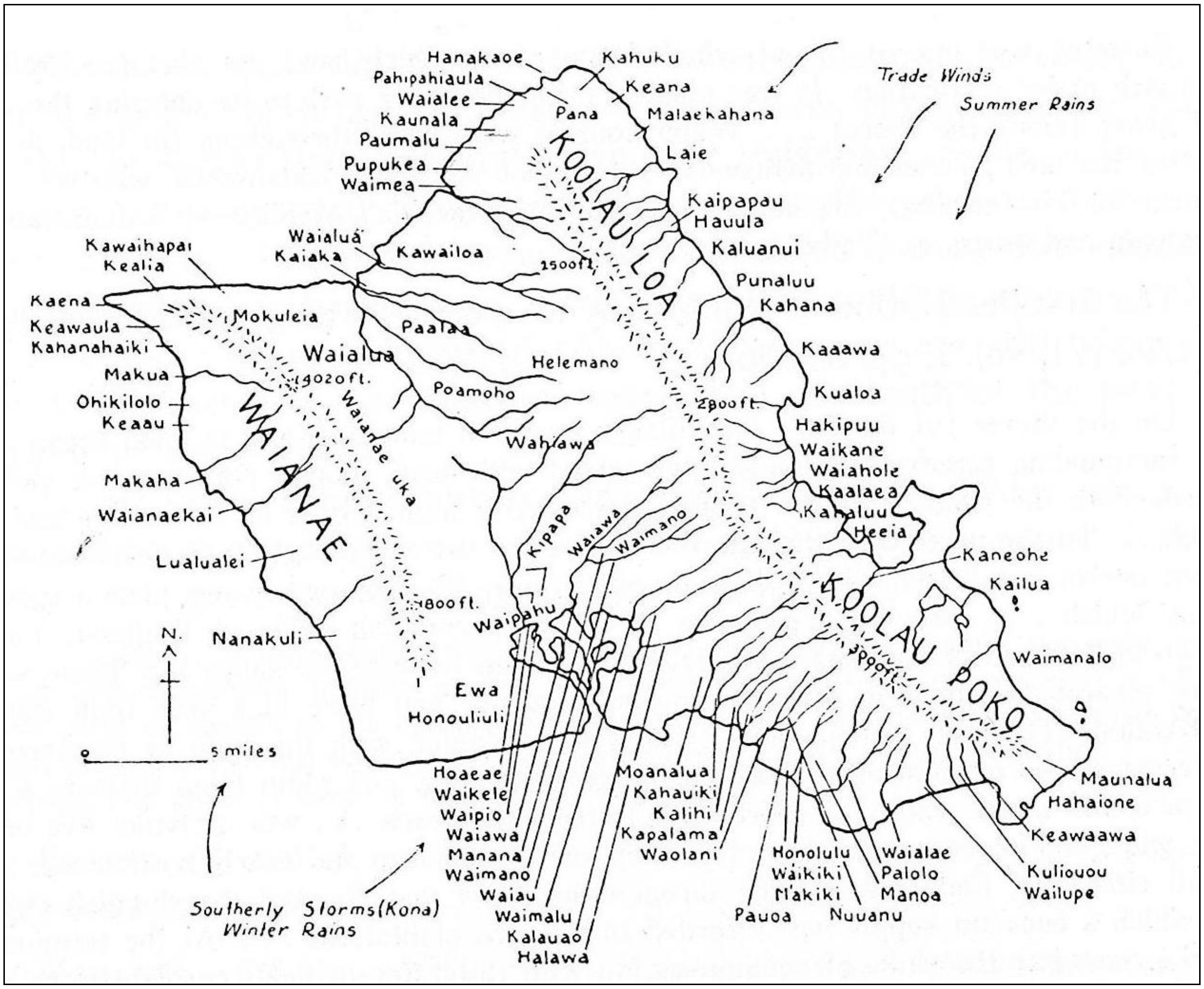


Figure 4. *Moku* and *ahupuaʻa* of Oʻahu (Handy 1940:75)

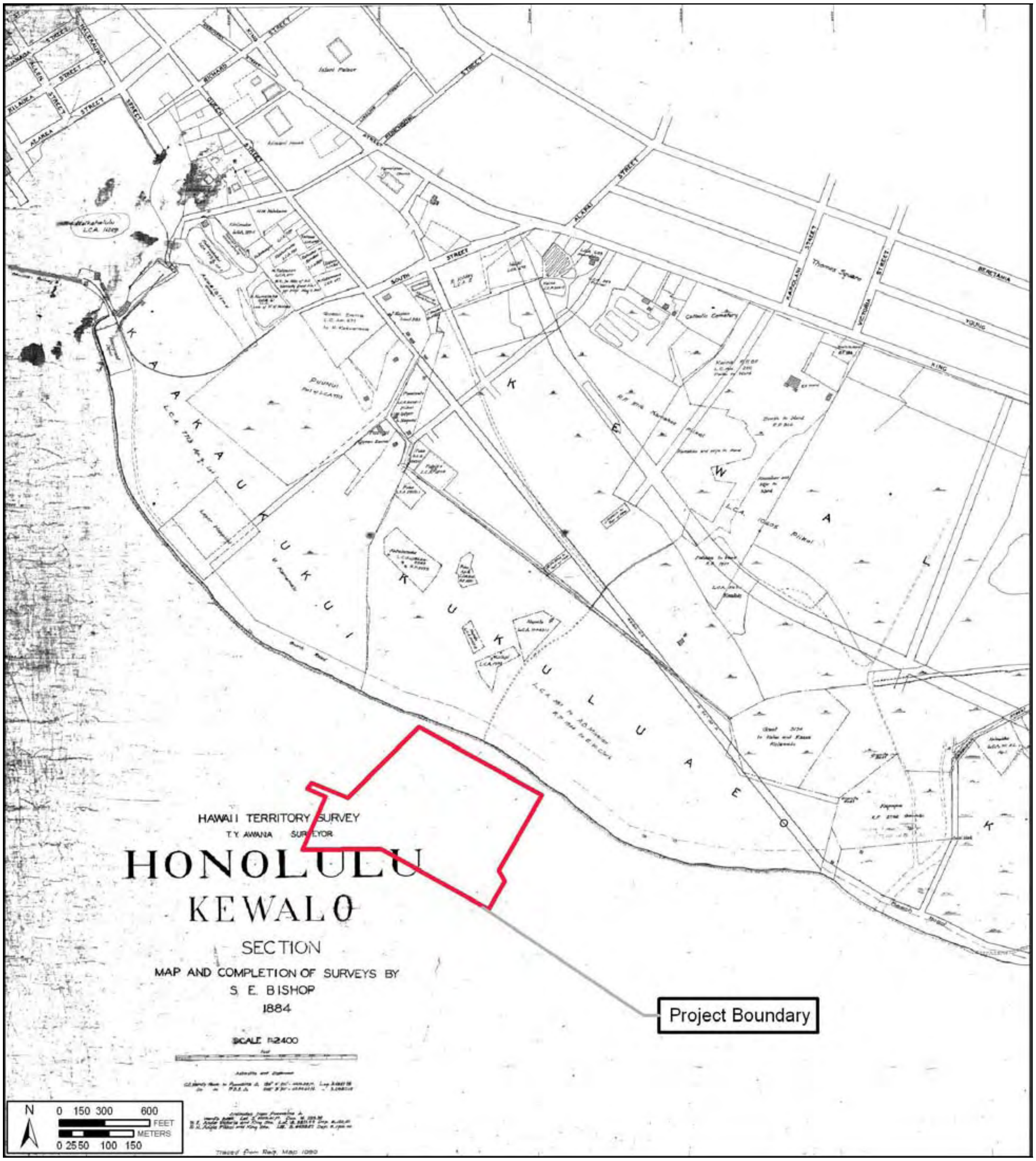


Figure 5. Portion of 1884 map of Honolulu, Kewalo Section, by Sereno Bishop, showing the locations of LCA parcels and ponds with the Project area; note the former shoreline before reef areas were filled-in to make new land for Kewalo Basin wharfs and the Ala Moana Park

1.4.2 Natural Setting

The Kakaʻako Project area is within a physiographic region of Oʻahu called the Honolulu Plain, an area generally less than 4.5 meters (m), or 15 feet (ft), above mean annual sea level (Davis 1989:5). The Honolulu Plain is stratified with late-Pleistocene coral reef substrate overlain with calcareous marine beach sand or terrigenous sediments (i.e., formed from erosion of rocks on land), and stream-fed alluvial deposits (i.e., material deposited by running water) (Armstrong 1983:36). A high stand of the sea for the Hawaiian Islands, ca. 1.5 to 2.0 m above present sea level, has been well documented between 4,500 and 2,000 years ago (Stearns 1978; Athens and Ward 1991; Fletcher and Jones 1996; Grossman and Fletcher 1998; Grossman et al. 1998; Harney et al. 2000).

The deposition of marine sediments during this elevated sea level greatly affected the Honolulu coastline. The subsequent drop in sea level to its present level, ca. 2000 years ago, created a slightly erosional regime that may have removed sediments deposited during the preceding period of deposition (Dye and Athens 2000:19). However, the net gain in sediments would have been substantial. Nakamura (1979:65), citing a Hawaiian Territory Sanitary Commission Report, estimated that about one-third of the Honolulu Plain was a wetland in 1911. Pre-Contact Hawaiians used the lagoon/estuary environment of the Honolulu Plain to construct fishponds. Fishpond walls served as sediment anchors for the accumulation of detrital reef sediments. They also likely affected long shore sedimentary transport, resulting in new littoral deposition and erosion patterns. Fishponds, which the Hawaiians no longer actively maintained or utilized in the post-Contact period, became locations for the deposition of fill. These reclaimed areas provided valuable new land near the heart of growing urban Honolulu.

1.4.3 Soil Types

Virtually the entire Project area lies on relatively recently created land. Soil maps indicate that all of the land is “Fill Land Mixed” (FL) or water (Figure 6) (Foote et al. 1972).

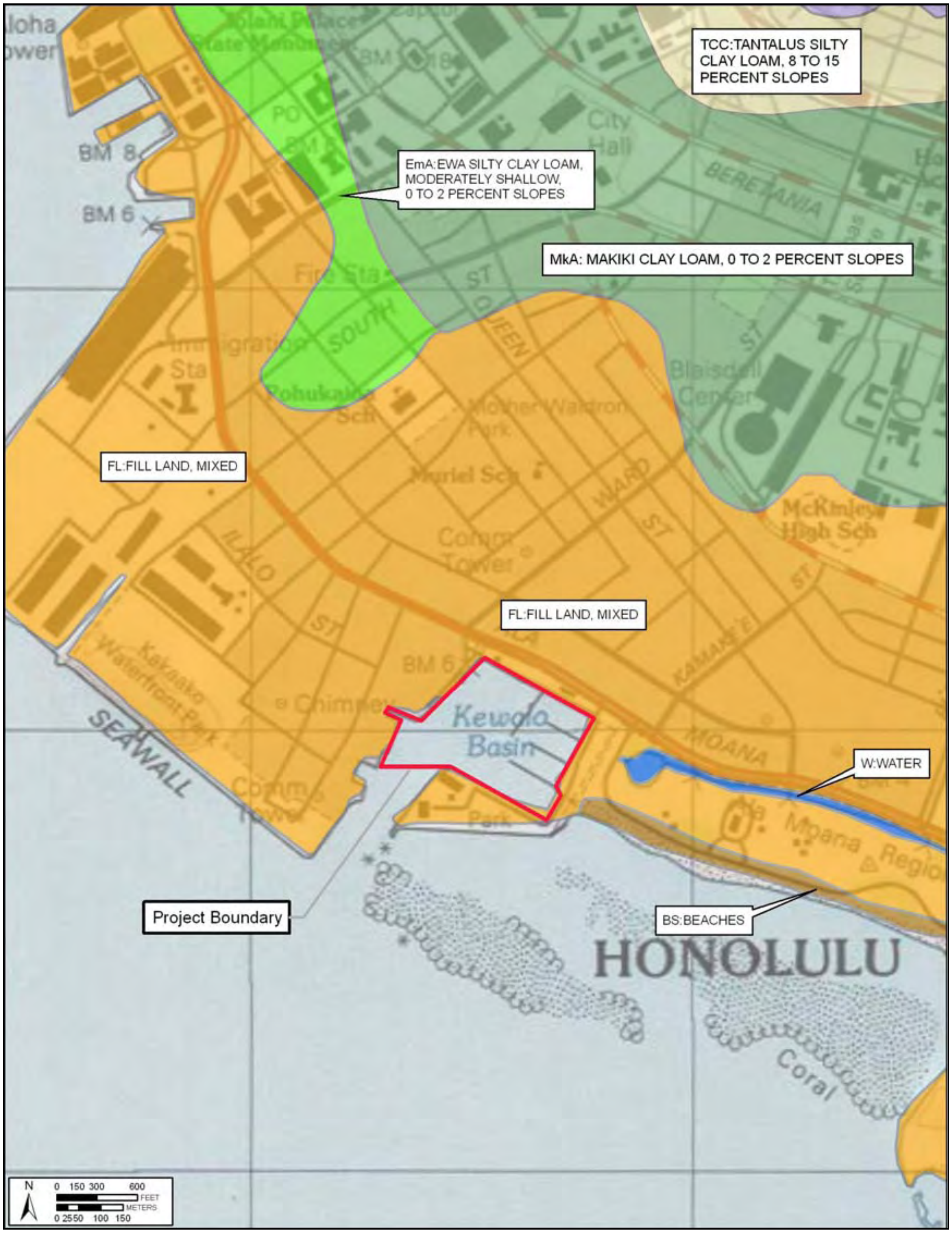


Figure 6. Portion of 1998 Honolulu USGS 7.5-minute series topographic quadrangle showing the Project area with soil overlay (Foote el al. 1972)

Section 2 Methods

2.1 Archival Research

Historical documents, maps and existing archaeological information pertaining to Kakaʻako were researched at the CSH library and other archives including the University of Hawaiʻi at Mānoa's Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawaiʻi State Archives, the State Land Survey Division, and the archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards (LCAs) was accessed through Waihona ʻAina Corporation's Māhele Data Base (www.waihona.com) as well as a selection of CSH library references.

For cultural studies, research for the Traditional Background section centered on Hawaiian activities including: religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; as well as Hawaiian place names and *moʻolelo* (stories, oral traditions), *mele* (songs), *oli* (chants), *ʻōlelo noʻeau* (proverbs) and more. For the Historic Background section, research focuses on land transformation, development and population changes beginning in the early post–European Contact era to the present day (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods, including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies, such as CIAs, to recruit people that are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to "identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied….This approach to sampling allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of knowledge" (Mays and Pope 1995:110).

We began with purposive sampling informed by referrals from known specialists and relevant agencies. For example, we contacted the SHPD, Office of Hawaiian Affairs (OHA), Oʻahu Island Burial Council (OIBC), and community and cultural organizations in Kakaʻako for their brief response/review of the project and to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and vicinity, cultural and lineal descendants of Kakaʻako, and other appropriate community representatives and members. Based on their in–depth knowledge and experiences, these key respondents then referred CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who would be likely candidates for the study (Bernard 2006:192). CSH also employs expert or judgment sampling which involves assembling a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community consultants: cultural practitioners and specialists, community representatives and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and from the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council and Civic Club meetings) in (or near) the study area to scope for participants. Please refer to Table 2, Section 7, for a complete list of individuals and organizations contacted for this CIA.

CSH focuses on obtaining in–depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the project, CSH reports include in–depth contributions from about one–third of all participating respondents. Typically this means three to twelve interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: (1) before beginning the interview the CSH researcher explained to the participant how the consent process works, the Project purpose, the intent of the study and how his/her information will be used; (2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix C); (3) if the person agreed to participate by way of signing the consent form or providing oral consent, the researcher started the interview; (4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original is stored at CSH; (5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished either via phone, post or email or through a follow–up visit with the participant; (6) the participant received the final approved interview and any photographs taken for the study for record. If the participant was interested in receiving a copy of the full transcript of the interview (if there is one as not all interviews are audio-recorded and transcribed), a copy was provided. Participants were also given information on how to view the report on the OEQC website and offered a hardcopy of the report once the report is a public document.

If an interviewee agreed to participate on the condition that his/her name is withheld, procedures are taken to maintain his/her confidentiality (see Protection of Sensitive Information below).

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi–structured interviews (as described by Bernard 2006) asking questions from the following broad categories: gathering practices and *mauka* and *makai* resources, burials, trails, historic properties and *wahi pana* (storied places). The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. For example, for this study fishing, surfing, and other recreational uses of the ocean were emphasized over other categories less salient to Project participants. These interviews and oral histories supplement and provide depth to consultations from government agencies and community organizations that may provide brief responses, reviews and/or referrals gathered via phone, email and occasionally face–to–face commentary.

2.2.3.1 In–depth Interviews and Oral Histories

Interviews were conducted initially at a place of the study participant’s choosing (usually at the participant’s home or at a public meeting place) and/or—whenever feasible—during site visits to the Project area. Generally, CSH’s preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours, and records the—who, what, when and where of the interview. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations, etc.).

2.2.3.2 Field Interviews

Field interviews are conducted with individuals or in focus groups comprised of with *kūpuna* (elder) and *kama‘āina* (Native-born) who have a similar experience or background (e.g., the members of an area club, elders, fishermen, hula dancers) who are physically able and interested in visiting the project area. In some cases, field visits are preceded with an off–site interview to gather basic biographical, affiliation and other information about the participant. Initially, CSH researchers usually visit the project area to become familiar with the land and recognized (or potential) cultural places and historic properties in preparation for field interviews. All field activities are performed in a manner so as to minimize impact to the natural and cultural environment in the project area. Where appropriate, Hawaiian protocol may be used before going on to the study area and may include the *ho‘okupu* (offering) of *pule* (blessing), and *oli*. All participants on field visits are asked to respect the integrity of natural and cultural features of the landscape and not remove any cultural artifacts or other resources from the area.

2.2.4 Protection of Sensitive Information

It is sometimes the case that participants in cultural studies agree to contribute their comments or be interviewed for a study on the condition that their names are withheld from the report. Their reasons for doing so vary from concern about protecting the identity of resource collectors and/or revealing the precise location of certain natural and cultural resources to opposition to the proposed Project. For the interviewee who agrees to participate on the condition that his/her name is withheld from public disclosure, CSH takes all precautions to make sure his/her contribution remains confidential. The confidentiality of subjects is maintained via protected files.

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno–historical and, more recently, TCP studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways: individual interview participants are compensated for their time in the form of a small honorarium and/or other *makana* (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and—when possible—a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources (for example in, Lānaʻi and Kahoʻolawe). Generally our goal is to provide educational opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the Chapter 343 environmental review process.

Section 3 Traditional Background

The Kakaʻako area remained outside the two most intensely populated and cultivated areas on southeastern Oʻahu—Waikīkī and Honolulu (or Kou)—during pre-Contact times, yet Hawaiians used the marshes and wetlands for salt making and farming of fishponds along with some limited wetland agriculture. The Kakaʻako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation (see Section 4.5). Much of the cultural and natural deposits and land forms of the area (lowland marches, sand deposits, coral reef flats, and fishponds) have survived below this fill, and numerous pre-Contact and post-Contact burials have been documented, largely the result of post-Contact epidemics (see Section 6.3). However, the history of land use of the Project area is very recent in time. The area was once primarily shallow coral reefs under water at high tide. The coastline along the Kakaʻako region was expanded in the early twentieth century as a result of dredging and reclamation of marsh lands. The Project area—the Kewalo Basin Harbor—was part of the Kukuluāeʻo coastline with marshes, salt pans, and fishponds in the late 1880s (see Figure 5). In successive waves of development, the coastline was extended *makai* to the current Ala Moana Boulevard by 1914, the Kewalo Channel was dredged in 1924 and expanded in 1941, and the dredged material was used to create a revetment—now the Kewalo Basin Park—in 1955 (Kewalo Basin Harbor 2009). For clarity, the cultural properties that were once located within Kakaʻako, including *wahi pana*, *heiau* (shrine), *loko iʻa* (fishpond), *ala hele* (path, road) and *ʻili*, are bolded in the text of Sections 3-4.

3.1 Wahi Pana

A Hawaiian *wahi pana*, also referred to as a place name, "physically and poetically describes an area while revealing its historical or legendary significance" (Landgraf 1994:v). *Wahi pana* can refer to natural geographic locations, such as streams, peaks, rock formations, ridges, and offshore islands and reefs, or they can refer to Hawaiian divisions, such as *ahupuaʻa* and *ʻili*, and man-made structures, such as fishponds. In this way, the *wahi pana* of the Kakaʻako, and the specific Project area tangibly link the *kamaʻāina* of Kakaʻako to their past. All *wahi pana* meanings are cited from Pukui et al. (1974) unless otherwise noted.

Pukui et al. (1974) do not give a meaning for the place name **Kakaʻako**, but Pukui and Elbert (1986:110) translate the word *kākāʻāko* as "dull, slow," and Thrum (1922:639) translated the word as "prepare the thatching," as *kākā* means "to chop, beat, or thresh" and *ako* means "thatch." If Thrum's translation is correct, it could be related to the fact that salt marshes, such as areas like Kakaʻako, were excellent places to gather tall *pili* (a type of grass), which the Hawaiians traditionally used to thatch their houses.

Kaʻākaukukui, a filled in reef, means "the right (or north) light," and it may refer to a maritime navigation landmark. According to Kekahuna (1958:4), Kaʻākaukukui was "a beautiful sand beach and reef that formerly extended a quarter mile along Ala Moana Park to Kewalo Basin. Various translations of Kaʻākaukukui include "radiating place for lamp" (Thrum 1922:635) and "to the right of the lighthouse" (Gessler 1937:187). This would have been an accurate description of the area at that time as Kaʻākaukukui was east, or "to the right" of the

Honolulu Lighthouse in the harbor. This is probably a historic, not an ancient, interpretation as the Honolulu Lighthouse was not built until 1869 (Dean 1991:7). Kaʻākaukukui was a *lele* (a detached part or lot of land belonging to one *ʻili* and located in another) with one parcel on the coast and two other, non-contiguous parcels inland. Kaʻākaukukui was adjacent on the *mauka* side to several other small *ʻili* and *lele* lands, including portions of **Puʻunui** (big hill) and **Pualoalo** (*Hibiscus kokio*; Thrum 1922:667).

Kukuluāeʻo, which translates literally as the "Hawaiian stilt (bird)," means "to walk on stilts." This area on the upland side of Kaʻākaukukui (Kekahuna 1958:4) formerly fronted Kewalo Basin and was an ideal environment for the Hawaiian stilt with its marshes, salt pans, and small fishponds (Griffin et al. 1987:36).

Kolowalu was a small land section between Kukuluāeʻo and Kewalo that encompassed a large fishpond. Pukui et al. (1974:116-117) do not give a meaning for Kolowalu Pond, but they interpret the name of Kolowalu, a ridge in Mānoa, as "eight creeping." As Kolowalu Kai was probably associated with Mānoa, it is possible that "eight creeping" is also the correct interpretation for the pond name. Thrum (1922:652) interpreted *kolowalu* as "a beneficent law of Kualii." The *kolowalu* law was initiated by the Hawaiian chief Kūaliʻi, who ruled Oʻahu from about 1720 to 1740 (Cordy 2002:19). This law protected the rights of commoners and provided food to the hungry (Fornander 1917, History of Kualii, Vol. IV (2):432).

Kewalo literally means "the calling (as an echo)." Land Commission and other historic-era documents identify it as the area between Cooke and Sheridan Streets *mauka* of Queen Street and the coastal sections of Kaʻākaukukui, Kukuluāeʻo, and Kālia. According to Pukui et al. (1974:109), *kauwā*, or members of a pariah caste, intended for sacrifice were drowned there (see Section 3.2.3). At one time, there was a sand beach at Kewalo, where various sports, such as surfing were held (Kekahuna 1958). The *ʻōlelo noʻeau*, "*Ka wai huahuaʻi o Kewalo*," which translates as "The bubbling water of Kewalo" (Pukui 1983:178), suggests that Kewalo once contained a freshwater spring. A *moʻolelo* of Kawaiahaʻo (see Section 3.2.2) also mentions two springs in Kewalo— Kawaiahaʻo (The Waters of Haʻo) and Kewalo Spring (Pukui 1988:87-89).

Kōʻula (red sugar cane) is the area around Thomas Square and the *mauka* portion of the Ward Estate, suggesting that the Kawailumalumai Pond may have been east of the Ward Estate. It may be part of the pond complex awarded to Koalele (LCA 3169), which is pictured on the 1884 Bishop map to the southeast of the Ward/Booth estate (LCA 274).

3.2 Moʻolelo

3.2.1 Kūʻula

Kakaʻako is mentioned in Thrum's version of the legend of Kūʻula, the god presiding over the fish, and his son ʻAiʻai. The son ʻAiʻai was the first to teach the Hawaiians how to make various fishing lines and nets, the first to set up a *koʻa kūʻula*, a rock shrine on which the fishermen would place their first catch as an offering to Kūʻula, and the first to set up *koʻa iʻa*, fishing stations where certain fish were known to gather. Leaving his birthplace in Maui, ʻAiʻai traveled around the islands, establishing *koʻa kūʻula* and *koʻa ia*. On Oʻahu, he landed first at Makapuʻu in Koʻolaupoko, and then traveled clockwise around the island:

> Aiai came to Kalia [Waikīkī] and so on to Kakaako. Here he was befriended by a man named Apua, with whom he remained several days, observing and listening to the murmurs of the chief named Kou. This chief was a skillful haiku [bonito] fisherman, his grounds being outside of Mamala until you came to Moanalua. There was none so skilled as he, and generous withal, giving akus to the people throughout the district. (Thrum 1998:242)

3.2.2 Kawaiahaʻo

Two springs in Kewalo are mentioned in the *moʻolelo* of the Waters of Haʻo, which describes two children of the chief Haʻo who ran away from their cruel stepmother. They stayed a time with the caretakers of Kewalo Spring, which may have been located close to the trail that connected Waikīkī and Honolulu. The children then left when they heard that the chiefess had sent men to look for them. The two children followed the moonlit trail across the plain toward Kou (Honolulu), but finally collapsed from weariness and thirst. In a dream, the boy's mother told him to pull up a plant close to his feet. When he did, he found a spring under the plant, which was called the Water of Haʻo, or Kawaiahaʻo. This spring is located at the western end of the trail, near Kawaiahaʻo Church in Kakaʻako (Pukui 1988:87-89).

3.2.3 Kānāwai Kaiheheʻe

Kewalo once had a famous fishpond that was used to drown the *kauwā* and *kapu* (taboo) breakers as the first step in a sacrificial ritual known as Kānāwai Kaiheheʻe (Kamakau 1991:6) or Ke-kai-heʻeheʻe, which translates as "sea sliding along," suggesting the victims were slid under the sea (Westervelt 1963:16). Kewalo is described as:

> A fishpond and surrounding land on the plains below King Street, and beyond Koula. It contains a spring rather famous in the times previous to the conversion to Christianity, as the place where victims designed for the Heiau of Kanelaau on Punchbowl slopes, was first drowned. The priest holding the victim's head under water would say to her or him on any signs of struggling, "Moe malie i ke kai o ko haku." "Lie still in the waters of your superiors." From this it was called Kawailumalumai, "drowning waters." (Sterling and Summers 1978:292)

3.2.4 Kukaeunahiokapueo

In one legend, Kewalo is a marsh near the beach, where tall pili grass grew. A man named Kapoʻi went to this area to get thatching for his house. While there, he found seven eggs of a *pueo* (Hawaiian short-eared owl) and took them home to cook for his supper. An owl perched on the fence surrounding his house and cried out "O Kapoi, give me my eggs!" After several such pleas, Kapoʻi eventually returned the eggs. In return, the owl became his *ʻaumakua* (deified ancestor) and instructed him to build a *heiau* named Mānoa. Kapoʻi built the *heiau*, placed some bananas on the altar as a sacrifice, and set the *kapu* days for its dedication. The king of Oʻahu, Kākuhihewa, who was building his own *heiau*, had made a law that if any man among his people erected a *heiau* and set the *kapu* before him, that man should die. Kapoʻi was seized and taken to the *heiau* of Kūpalaha at Waikīkī. Kapoʻi's *ʻaumakua* asked for aid from the king of the owls at Puʻu Pueo in Mānoa, who gathered all of the owls of the islands. They flew to Kūpalaha and battled the king's men, who finally surrendered: "The owls scratched at the eyes and noses of the men and befouled them with excrement" (Kamakau 1991:23). From this time, Hawaiians considered the owl a powerful *akua* (god, divine). Because of this battle, the Hawaiians name the area Kukaeunahiokapueo, which means, "the confused noise of owls rising in masses" (Westervelt 1963:135-137; Thrum 1998:200-202).

3.2.5 Huanuikalalaʻilaʻi

Kewalo was the birthplace of Huanuikalalaʻilaʻi, a chief famous for his love of cultivation at Kewalo and his care for the people (Kamakau 1991:24). An *oli*, recounted by Kamakau (1991:24), captures the significance of Kewalo:

ʻO Hua-a-Kamapau ke ʻliʻi	Hua-a-Kamapau the chief
O Honolulu o Waikīkī	O Honolulu, of Waikīkī
I hanau no la i kahua la i Kewalo,	Was born at Kewalo,
ʻO Kālia la kahua	Kālia was the place [the site]
O Makiki la ke ēwe,	At Makiki the placenta,
I Kānelāʻau i Kahehuna ke piko,	At Kānelāʻau at Kahehuna the navel cord,
I Kalo i Pauoa ka ʻaʻa;	At Kalo at Pauoa the caul;
I uka i Kahoʻiwai i	Upland at Kahoʻiwai, at
Kanaloahoʻokau . . .	Kanaloahoʻokau. . .

Kamakau (1991:24-25) recorded a traditional *wānana* (prophecy) that mentions the chief Huanuikalalaʻilaʻi of Puʻukea Heiau:

[Ka makaua ua kahi o ʻEwa]	[The increasing "first rain" of ʻEwa]
Ua puni ka iʻa o Mokumoa,	Overcomes the fish of Mokumoa,
Ua kau iʻa ka nene;	Washes up fish to the nene plants;
Ua haʻa kalo haʻa nu;	Lays low the taro as it patters down;
Haʻa ka iʻa o Kewalo,	Lays low the fish of Kewalo,
Haʻa na ʻualu o Pahua,	Lays low the sweet potatoes of Pahua,
Haʻa ka mahiki i Puʻukea,	Lays low the mahiki grass at Puʻukea,
Haʻa ka unuunu i Peleʻula,	Lays low the growing things at Peleʻula
Haʻa Makaaho i ke ala.	Lays low Makaaho [Makāho] in its path
E Kū e, ma ke kaha ka ua, e Kū,	O Kū, the rain goes along the edge [of the island], O Kū
[I ʻai na ka iʻa o Maunalua] . . .	["Eating" the fish of Maunalua] . . .

The chant mentions the *mahiki* grass of Puʻukea, a tufted rush found near the seashore. The term *mahiki* connotes several historical and contemporary meanings. With serious family discord, a *kupuna* can contine with lines of inquiry of *hoʻoponopono* (family conference in which relationships are set right) to "peel off" layers of deeper feelings (Pukui et al. 1972:228). In a deeper Hawaiian past, skilled *kāhuna* (priests) formely exorcised malicious spirits from the afflicted in an exorcist ritual with the aid of *mahiki* (shrimp or a grass called *ʻakiʻaki*) (Pukui and Elbert 1986:219). The use of this grass in a ritual may explain its association with a ceremonial *heiau*, or it may simply be that the Kukuluāeʻo coast was a good habitat and thus a favored place for healers to collect this type of grass.

3.2.6 Ka‘ākaukukui

Ka‘ākaukukui is briefly mentioned in the legend of Hi‘iaka, beloved sister of the Hawaiian volcano goddess, Pele. Hi‘iaka and her companions had been traveling around O‘ahu on the land trails, but decided to travel from Pu‘uloa (Pearl Harbor) to Waikīkī by canoe. At Pu‘uloa, Hi‘iaka met a party who were planning to travel to the house of the chiefess Pele‘ula in Waikīkī. Hi‘iaka recited a chant, telling the people that although they were going by land and she was going by sea they would meet again in Kou (ancient name of Honolulu). One portion of the chant mentions the place Ka‘ākaukukui, with reference to a pool, possibly a reference to the salt ponds of the area:

A pehea lā au, e Honoka‘upu, ku‘u aloha	And what of me, O Honoka‘upu, my love
I ka welelau nalu kai o Uhi, o ‘Ōa	Upon the crest of the surf at Uhi and *‘Oā*
‘O nā makai ke ao (pō) o poina	Eyes in the living realm (night) of oblivion
Ma hea lā wau, e ke aloha lā	Where am I, O my love
‘O Kou ka papa	Kou is the coral flat
‘O Ka‘ākaukukui ka loko	Ka‘ākaukukui is the pool
‘O ka ‘alamihi a‘e nō	Some ‘alamihi indeed
‘O ka lā a pō iho	Wait all day until night
Hui aku i Kou nā maka.	Friends shall meet in Kou.

(Ho‘oulumāhiehie 2006a:297; Ho‘oulumāhiehie 2006b:277)

The exact meaning of the word *‘alamihi* within this chant is unknown. *‘Alamihi* is the name of a Native Hawaiian small black crab, a scavenger that is often associated in Hawaiian sayings with corpse-eating (Pukui and Elbert 1986:18). *Alamihi* can also mean “path [of] regret” (Pukui et al. 1974:9).

3.3 Heiau

The chief Huanuikalala‘ila‘i governed Pu‘ukea Heiau in the land section of Kukuluāe‘o, according to Kamakau (1991a:24). Pu‘ukea literally means “white hill” and is also the name of a small land division within the *‘ili* of Kukuluāe‘o that is mentioned in at least two Land Commission cases, LCA 1502 (not awarded) and LCA 1504. LCA 1504 is located near the junction of Halekauwila Street and Cooke Street. It is common for a *heiau* to have the same name as the *‘ili* in which it is located, so it is possible that Pu‘ukea Heiau was also near the junction of Halekauwila and Cooke Streets. The majority of the house sites in the mid-nineteenth century in Kukuluāe‘o were located near Halekauwila Street and Queen Street, *mauka* of the low-lying coastal swamplands on higher, dry ground. It is possible that the *heiau* platform or the area that it was built on was one of the few elevated locations in the flat, low-lying swamp that surrounded it, and thus gained the name *pu‘u kea*, or “white hill.”

3.4 Ala Hele

John Papa ‘Ī‘ī (1959) mentions some relevant place names while discussing early nineteenth-century trails in the Honolulu/Waikīkī area (Figure 7). The fact that a trail traversed this region that was characterized by ponds, marshlands, and *lo‘i* (irrigated terrace) suggests that the trail, especially as it neared the coastline at Kālia, must have run on a sand berm raised above surrounding wetlands and coral flats. ‘Ī‘ī describes the middle trail (probably close to the current alignment of Queen Street) from Waikīkī to Honolulu:

> The trail from Kalia led to Kukuluaeo, then along the graves of those who died in the smallpox epidemic of 1853, and into the center of the coconut grove of Honuakaha. On the upper side of the trail was the place of Kinau, the father of Kekauonohi. (‘Ī‘ī 1959:89)

The grave site referred to is the Honuakaha Cemetery at the *makai* corner of Halekauwila and South Streets, *makai* of Kawaiaha‘o Church. Honuakaha was a settlement located generally between Punchbowl and South Streets, on the *makai* side of Queen Street. ‘Ī‘ī describes the lower, coastal trail from Honolulu towards Waikīkī:

> From the makai side of Kaoaopa was a trail to the sea at Kakaako, where stood the homes of the fishermen. Below the trail lived Hewahewa and his fellow kahunas. (‘Ī‘ī 1959:91)

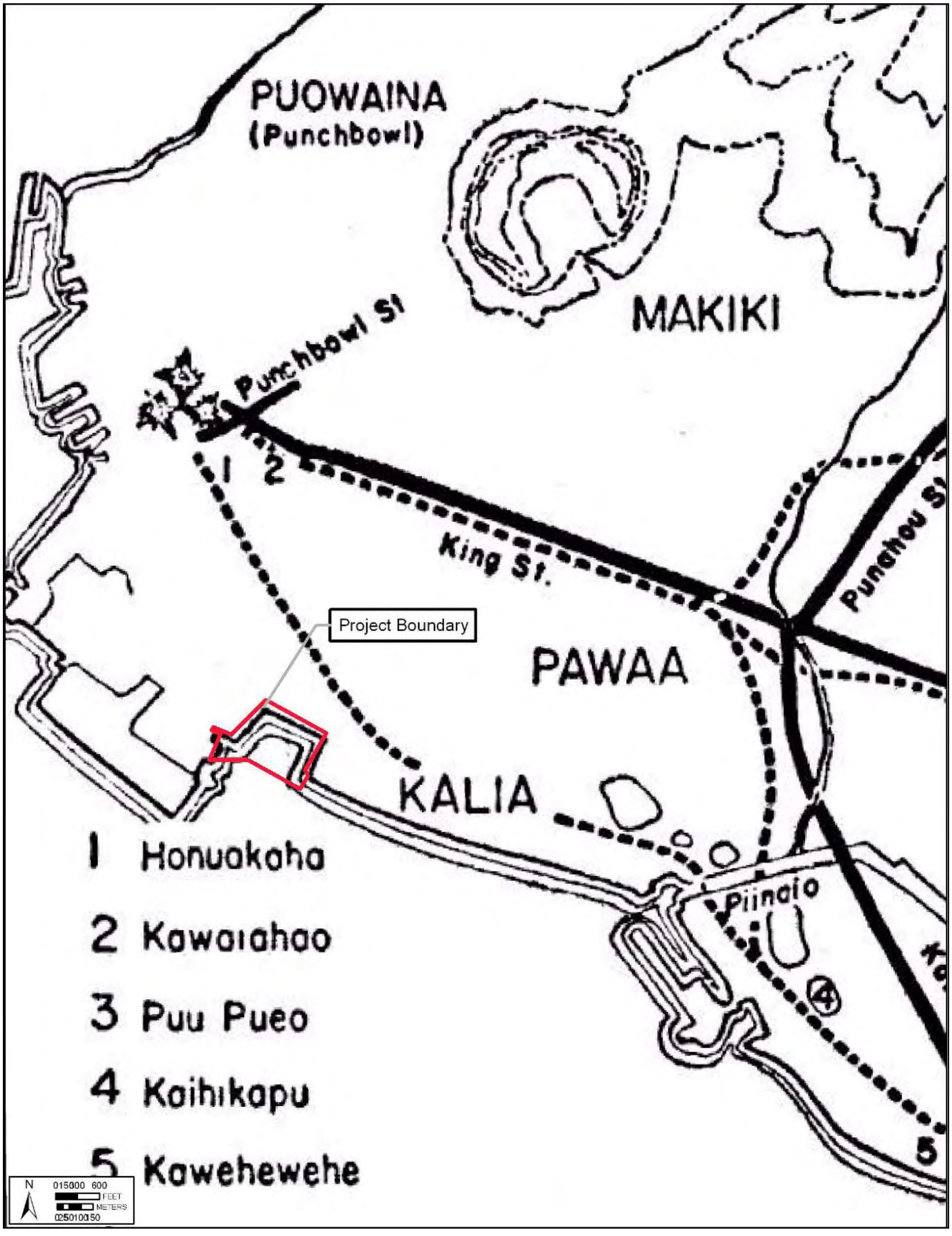


Figure 7. Portion of map of trails (around1810) near the Project area (ʻĪʻī 1959:93)

3.5 Ilina

There is no documented evidence from archaeological surveys, historical records or oral traditions of pre-Contact *ilina* (graves) or *iwi kūpuna* (ancestral remains) within the Project area. Indeed, the Kewalo Basin harbor was formerly a shallow reef that enclosed a deep section of water. However, human skeletal remains were discovered near the early coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002) (See Section 6.3).

3.6 Agriculture and Aquaculture

Kaka‘ako (the modern district) is between two traditional centers of population, Kou (Honolulu) and Waikīkī. In Waikīkī, a system of irrigated taro *lo‘i* fed by streams descending from Makiki, Mānoa, and Pālolo Valleys blanketed the plain, and networks of fishponds dotted the shoreline. Similarly, Kou—the area of downtown Honolulu surrounding the harbor—possessed shoreward fishponds and irrigated fields watered by perennial streams descending from Nu‘uanu and Pauoa Valleys. Rev. Hiram Bingham, arriving in Honolulu-Kou in 1820, described a still predominantly Native Hawaiian environment—still a “village”—on the brink of western-induced transformations:

> We can anchor in the roadstead abreast of Honolulu village, on the south side of the island, about 17 miles from the eastern extremity. . . . Passing through the irregular village of some thousands of inhabitants, whose grass thatched habitations were mostly small and mean, while some were more spacious, we walked about a mile northwardly to the opening of the valley of Pauoa, then turning southeasterly, ascending to the top of Punchbowl Hill, an extinguished crater, whose base bounds the northeast part of the village or town. . . . Below us, on the south and west, spread the plain of Honolulu, having its fishponds and salt making pools along the seashore, the village and fort between us and the harbor, and the valley stretching a few miles north into the interior, which presented its scattered habitations and numerous beds of kalo in its various stages of growth, with its large green leaves, beautifully embossed on the silvery water, in which it flourishes. (Bingham 1847:92-93)

The Kaka‘ako district would have been in Bingham’s view as he stood atop “Punchbowl Hill” looking toward Waikīkī to the south. It would have comprised part of the area he describes as the “plain of Honolulu” with its “fishponds and salt making pools along the seashore.”

The pre-Contact shaping of Waikīkī, Honolulu, and the Kaka‘ako region is suggested by the 1817 map (Figure 8) by Otto von Kotzebue, commander of the Russian ship *Rurick*, who had visited O‘ahu the previous year. Kotzebue’s map also illustrates that the land between Pūowaina and the shoreline, which included the Kaka‘ako area, formed a “break” between the heavily populated and cultivated centers of Honolulu and Waikīkī. The area is characterized by fishponds (ovals), salt ponds (square clusters), trails connecting Honolulu and Waikīkī, and occasional taro *lo‘i* (rectangles) and habitation sites (trapezoids) along the main trail (later Queen Street). The depicted areas of population and habitation concentration probably reflect distortions caused by the post-Contact shift of Hawaiians to the area around Honolulu harbor—the only sheltered landing on Oʻahu and the center of increasing trade with visiting foreign vessels. This settlement pattern of fish and salt pans near the shore and habitations clustered around the *mauka* boundary of the Kakaʻako area near Queen and King Streets, is even more evident in the 1855 LaPasse map of Honolulu (Figure 9).

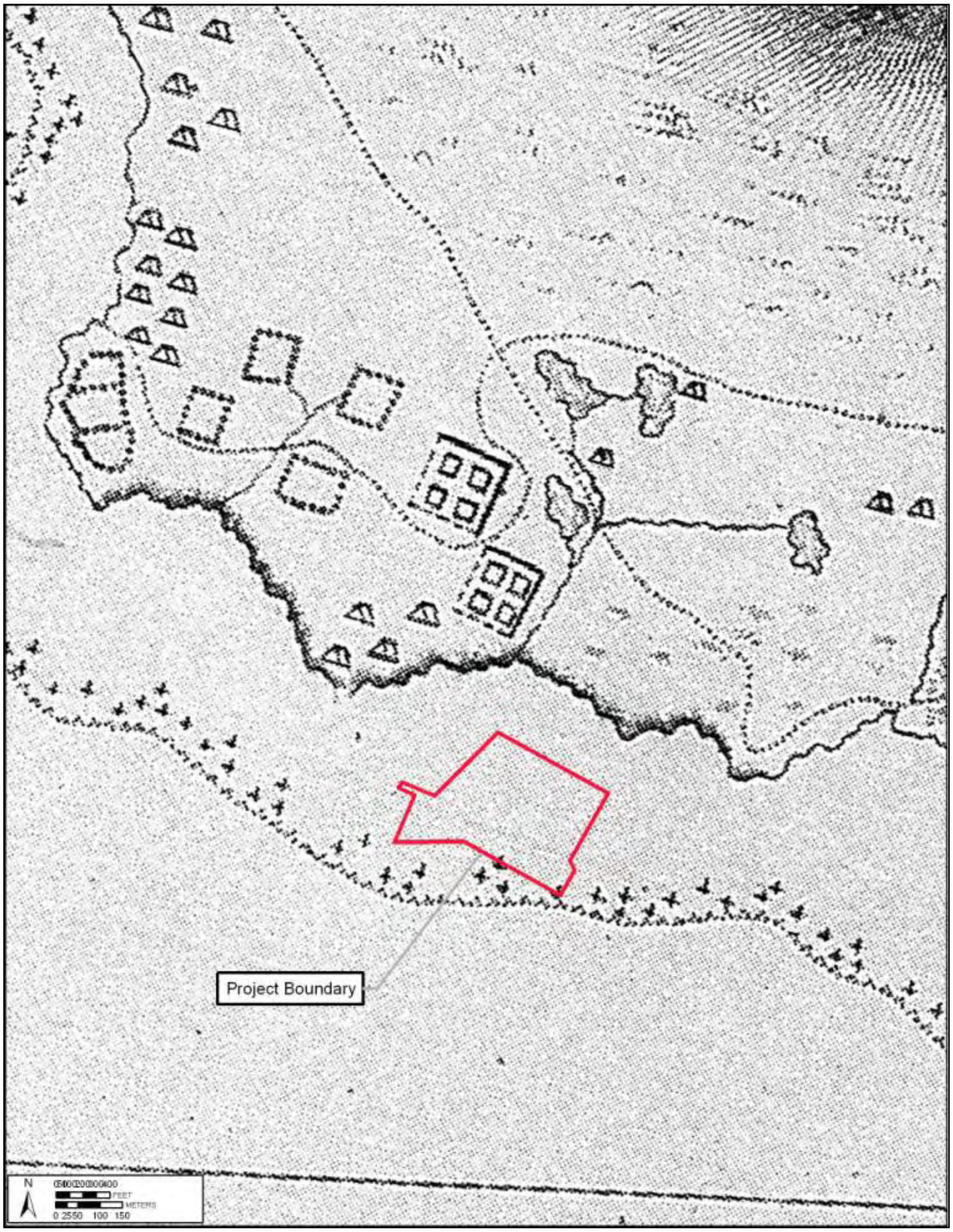


Figure 8. Portion of 1817 map by Otto von Kotzebue, commander of the Russian ship Rurick, showing fishponds and salt pans in the Kakaʻako area (map reprinted in Fitzpatrick 1986:48-49)

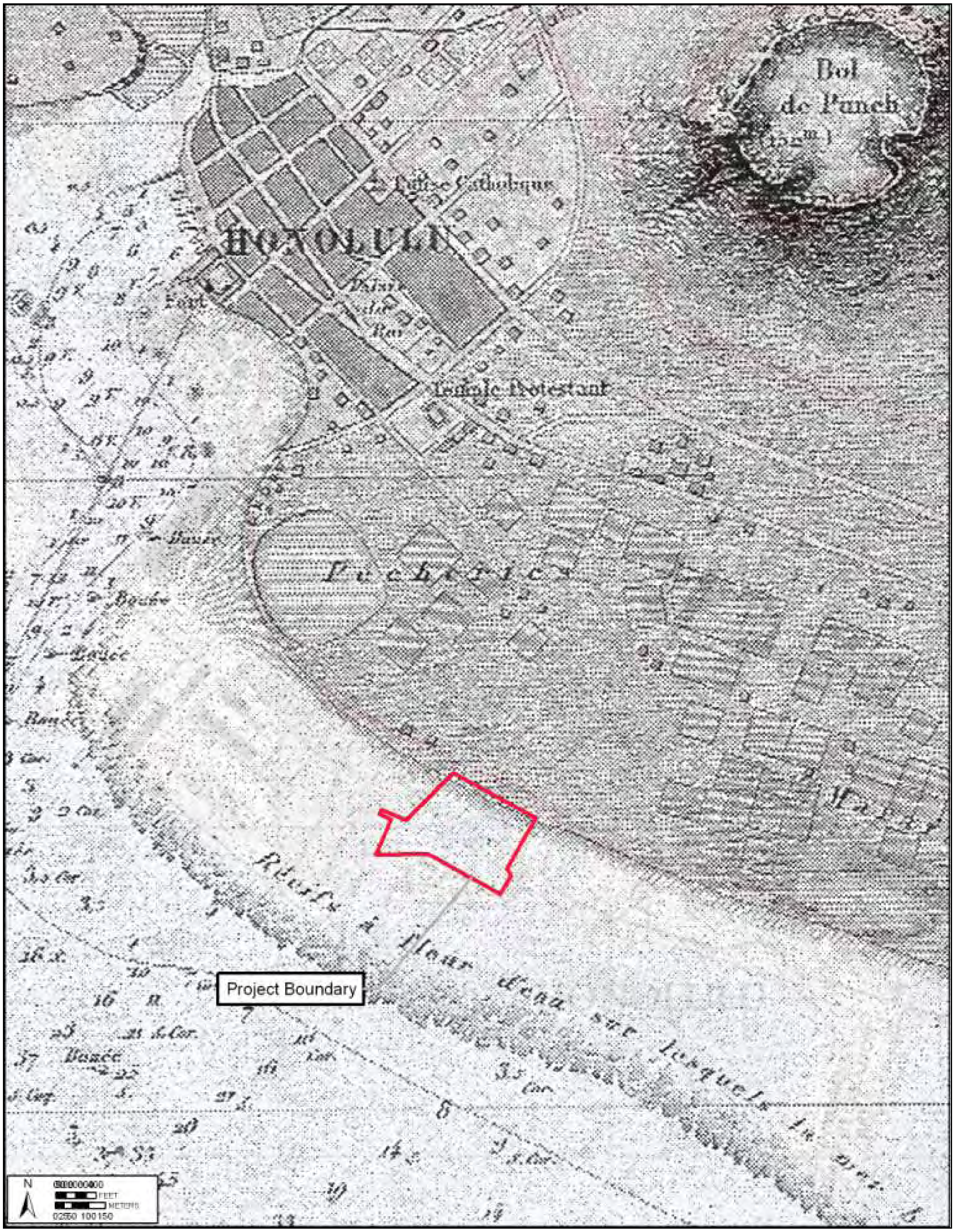


Figure 9. Portion of 1855 map of Honolulu by Lt. Joseph de LaPasse of the French vessel, *L`Eurydice*; Project area is adjacent to the southeast of an area labeled “*Pecheries*” (“Fishponds”) (map reprinted in Fitzpatrick 1986:82-83)

Section 4 Historical Background

The Kakaʻako area continued to remain outside Waikīkī and Honolulu during the post-Contact era. It served as a place of the dying and the dead, the trash and the wasteland, and the poor and immigrant; however, it also represents the birth of the modern centers of Waikīkī and Honolulu (Griffin et al. 1987:73).

4.1 Mid-1800s and the Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—that introduced private property into Hawaiian society. In 1848, the Crown and the *aliʻi* (chief) received their land titles. *Kuleana* (Native land rights) awards to commoners for individual parcels within the *ahupuaʻa* were subsequently granted in 1850. The crown lands were considered the private lands of the monarch, and many lands were sold or mortgaged during the reigns of Kamehameha III and IV to settle debts to foreigners. To end this practice, the Crown lands were made inalienable in 1865, and their dispensation was regulated by a Board of Commissioners of Crown Lands, which effectively put them under the administrative control of foreign-born residents (Kameʻeleihiwa 1992:310). Before the passage of the Act of January 3, 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

In 1850, the Privy Council passed resolutions that would affirm the rights of the commoners or native tenants. To apply for fee-simple title to their lands, native tenants were required to file their claim with the Land Commission within the specified time period of February 1846 and February 14, 1848. The Kuleana Act of 1850 confirmed and protected the rights of native tenants. Under this act, the claimant was required to have two witnesses who could testify they knew the claimant and the boundaries of the land, knew that the claimant had lived on the land for a minimum of two years, and knew that no one had challenged the claim. The land also had to be surveyed.

Not everyone who was eligible to apply for *kuleana* lands did so and, likewise, not all claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. For whatever reason, out of the potential 2,500,000 acres of Crown and Government lands "less than 30,000 acres of land were awarded to the native tenants" (Chinen 1958:31).

Among the first written descriptions of the Kakaʻako area by Hawaiians are the testimonies recorded during the 1840s and 1850s in documents associated with LCAs and awardees of the Māhele. According to LCA records, traditional Hawaiian usage of the region and its environs may have been confined to salt making and aquaculture, with some wetland agriculture in those areas *mauka* or toward Waikīkī at the very limits of the field system descending from Makiki and Mānoa Valleys. The testimonies indicate that Hawaiians lived and worked in the area before the nineteenth century. The LCA records also reveal that midway through the nineteenth-century, taro cultivation, traditional salt making, and fishpond farming activities continued within Kewalo/Kukuluāeʻo area. Due to the urbanization of Honolulu from the end of the nineteenth century, developers destroyed or buried the land features supporting these activities. The LCA records, historic maps, and archival photographs document more precisely traditional Hawaiian settlement and subsequent historic land usage near the present Project area. Table 1 is a list of LCA awards in the Kakaʻako area based on the 1884 Bishop map and the Waihona ʻAina database.

In the western portion of the Kakaʻako district, the *ʻili* of **Kaʻākaukukui** (LCA 7713) was awarded to Victoria Kamāmalu, sister of Kamehameha IV and Kamehameha V. There were no awards to commoners in this *ʻili*, which seems to have consisted entirely of land used for salt making. Early historic maps show no residences in this area until the twentieth century. The largest settlement in the vicinity was the village of Honuakaha, at the corner of Punchbowl and King Streets. The government awarded a large number of house lots to commoners in this area; late nineteenth-century and early twentieth-century maps always show a cluster of houses in this area.

The *ʻili* of **Pualoalo,** or Puaaloalo (10605-A), was awarded to Iona (Jonah) Piʻikoi. Piʻikoi was an *aliʻi*, a retainer of Kauikeaouli, Kamehameha III and held several government posts. It consisted of three *lele* lands, two in Nuʻuanu valley and a small parcel near the Kakaʻako Salt Works. On the 1884 Bishop map, there are four houses on this property.

The *ʻili* of **Puʻunui**, which also had several *lele* lands, included the large rectangular section *mauka* the Kakaʻako Salt Works. The upper portion was part of LCA 677 to Matio Kekūanaoʻa, a high *aliʻi* who was a close friend to Kamehameha II and was married to Kīnaʻu, the daughter of Kamehameha I. The lower portion was awarded to Victoria Kamāmalu as part of LCA 7713.

The *ʻili* of **Kukuluāeʻo** was originally awarded to the king as LCA 387, but he returned it to the government. The *ʻili* was then awarded to the American Board of Commissioners for Foreign Missions (ABCFM). Initially this land was associated with Punahou School in Mānoa Valley, as Chief Boki gave the Punahou lands to Hiram Bingham, pastor of Kawaiahaʻo Church in 1829 (DeLeon 1978:3). In the Māhele, however, this land became "detached" from the Mānoa award and was instead given to the pastor of the Kawaiahaʻo Church, as noted in a history of the Punahou School (Foster 1991).

Kolowalu, a triangular section of land between Kukuluāeʻo and Kewalo, was awarded to the government during the Māhele. This small land was probably a *lele*. Mānoa has such a division, with an *ʻili* called Kolowalu in the uplands and an *ʻili* called Kolowalu in the taro lands. The Kolowalu fishpond was probably the coastal portion of this *ʻili*. It was not a separate award in the Māhele, but was given in 1878 as a grant (Grant 3294) to Kaʻaua and Kalae, long-time caretakers of the land.

The seventh *ʻāpana* (lot) of the *ʻili* of **Kewalo** (LCA 10605) was awarded to Kamakeʻe Piʻikoi, wife of Jonah Piʻikoi (awardee of Pualoalo ʻIli). The husband and wife shared the award (Kameʻeleihiwa 1992:269). Kewalo was a large 270.84-acre land section extending from Kawaiahaʻo Church to Sheridan Street. This land section had numerous large fishponds, which were awarded as part of the claim to Piʻikoi. On the 1884 map (see Figure 5), Bishop uses the symbol for marshy land (a tuft of grass) throughout the background of this map of Kakaʻako and Kewalo. The LCA parcels were described as house lots, fishponds, salt ponds or salt lands, *kula* (plain, field) or some combination of the above. The 1884 map also shows the location of buildings; these may not always be houses. The map illustrates that people used the coastal strip mainly for salt collection; only a few house lots were nearby on Halekauwila and Queen Streets. Fishponds were scattered throughout the area, with some modified into long, narrow ponds probably used to raise fish and ducks. The main habitation areas were adjacent to King Street, on the *mauka* border or Kakaʻako, and in Honuakaha Village at the northwestern border of the Kakaʻako area.

Large portions of the Kukuluāeʻo and Kewalo sections of the Kakaʻako district were once part of the Ward Estate. This land was first awarded as LCA 272 to Joseph Booth. Joseph Booth was an early English resident of the Hawaiian Islands who operated a saloon and hotel in Honolulu, known at the time of the Māhele as the Eagle Tavern. He was granted lands in downtown Honolulu, Kewalo Uka (Pacific Heights area), the *ʻili* of Kapuni, and an area with "Three fish ponds, and a part of the plain near the road leading to Waikiki." Little information on these three fishponds is given in the LCA testimony, but the Royal Patent No. 306 for these lands, mentions one known as "the large fishpond" or "long fishpond," which had two huts beside it. The owners would later modify this pond into the "lagoon" on the Ward Estate. Figure 10 shows this long T-shaped fishpond and three "old fishponds" that seem to be overgrown with vegetation.

Curtis Perry Ward, a native of Kentucky, came to the Hawaiian Islands in 1853, and soon established a livery and draying business, moving goods from the harbor to Honolulu Town and loading goods at the docks for the whaling and shipping industries. In 1865, he married Victoria Robinson, who was descended from the Hawaiian *aliʻi* and early French and British residents. For his new family, Ward purchased at auction the 12-acre Kewalo estate of Joseph Booth, Royal Patent 306, and additional contiguous lands in the Kōʻula area in 1870. This constituted the *mauka* portion of "Old Plantation" from Thomas Square on King Street to the *makai* border at Waimanu Street. A few years later (but before 1875), Ward added to his property with the purchase of 77 acres and 3,000 feet of ocean frontage in the *ʻili* of Kukuluāeʻo, *makai* of Queen Street.

Mr. Ward built a house in the southern style (Figure 11) at the *mauka* end of the estate near King Street, and modified the fishponds into a long "lagoon" (Figure 12). After the death of her husband in 1882, Victoria Ward derived much of her income from "eggs, bananas, firewood, *ʻawa* (kava), taro leaf, *makaloa* (a kind of grass), chickens, fish, hay, pigs, salt, white sand, *mānienie* (a kind of grass), hides, butter, squid, and horses" (Hustace 2000:47) collected from her lands. Victoria Ward raised her seven daughters on this estate. In 1957, the City and County of Honolulu purchased the *mauka* portion of the estate, razed the old homestead, filled in the ponds and the long lagoon, and constructed the new Blaisdell Civic Center (Hustace 2000:67, 77).

Table 1. LCAs in the Kakaʻako District

LCA	Awardee	*ʻIli*	Comments
2	Robert Kilday	Pualoalo	Two fishponds in Kukuluāeʻo
200	Kaina, M.	Kawaiahaʻo; Koula	House lot
272	Joseph Booth	Koula	Royal Patent 306 to Joseph Booth
387	ABCFM	Beretania St., Punahou, Kawaiahaʻo, Kukuluaeo	Salt lands attached to Punahou
569	Puniwai	King St.	House lot with salt beds at *makai* end

LCA	Awardee	*ʻIli*	Comments
603	Hoonaulu	Waiahao; King St.	House lot
673	Naiwi	Kawaiahaʻo	House lot
677	Kekūanaoʻa for Kamāmalu	Honuakaha	Three lots on Queen Streets, salt pans on *makai* side; Parcel Two included Honuakaha guesthouse and cemetery
1503	Puaa	Kukuluaeo, Kewalo	House lot and four fishponds
1504	Pahika	Kukuluaeo, Kewalo	House lot, fishpond, salt bed
1903	Lolohi	Kukuluaeo	Two salt beds, 15 drains, two *poho kai* (hollows), one salt *kula*
3169	Koalele	Kewalo	*Makai* ponds
7713	V. Kamāmalu,	Honolulu	Retained
9549	Kaholomoku	Kukuluaeʻe	Fishpond and four salt pans on east side
10463	Napela	Kukuluaeʻe	House site, two ponds, one ditch, salt lands
10605	Piʻikoi, Iona	Kawelo, Puaaloalo,	Ponds; four structures

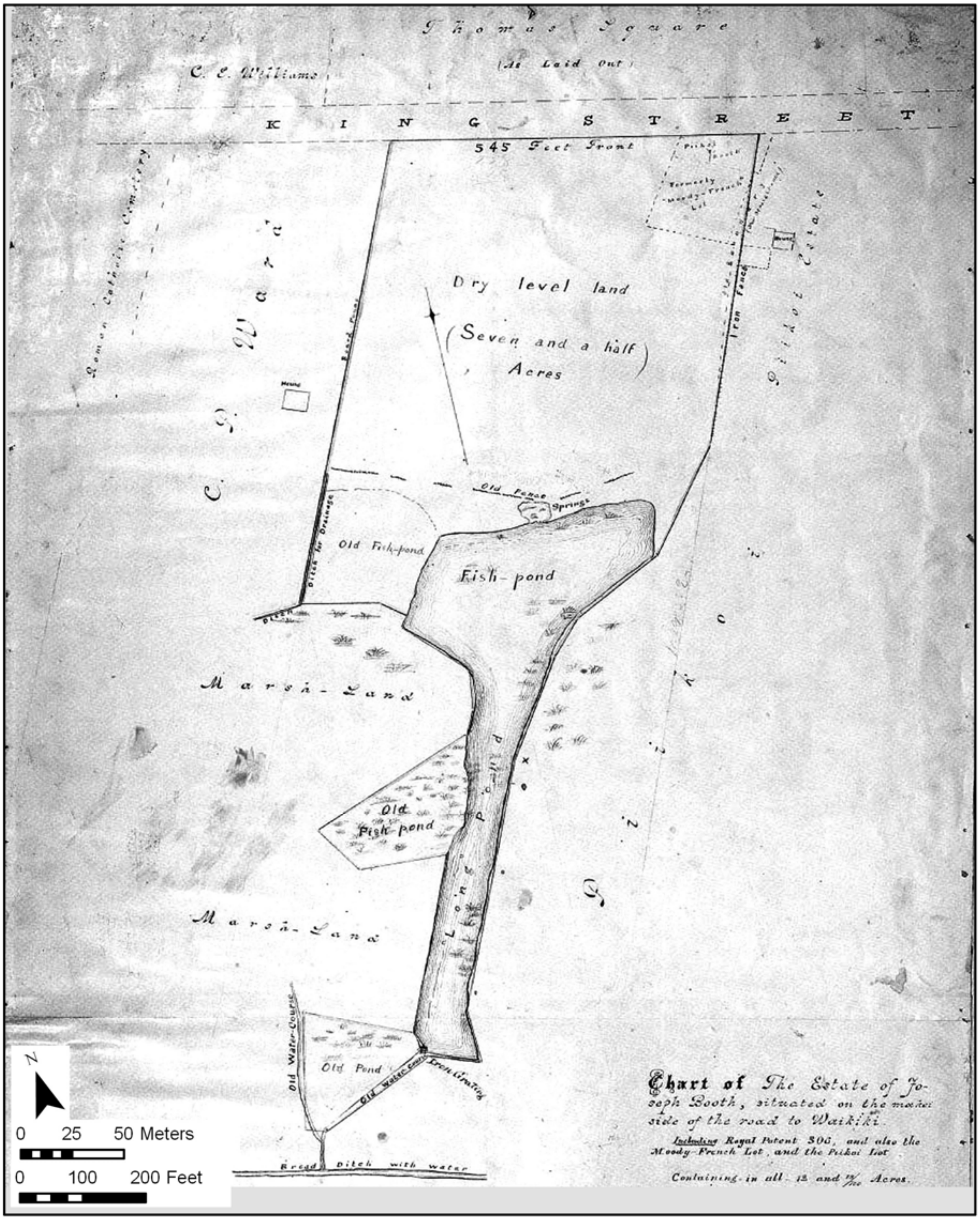


Figure 10. Estate of Joseph Booth, Royal Patent 206, LCA 272; later part of the Ward Estate (map reprinted in Hustace 2000:40)

Figure 11. 1880s photograph of the Old Plantation House, with the Ward family’s daughters and friends gathered on the lanai (photograph reprinted in Hustace 2000:46).

Figure 12. 1888 photograph of the “long lagoon” looking from the cupola of the Ward house towards the Kukuluāe‘o marshlands and the ocean (photograph reprinted in Hustace 2000:2)

4.2 Kaka‘ako Salt Works and the Salt Pans of Kewalo and Kukuluāe‘o

As noted in the Land Commission documents, much of the land in Kewalo and Kukuluāe‘o was used to produce salt (Figure 13 and Figure 14). The Hawaiians used *pa‘akai* (salt) to flavor food, to preserve fish by salting, for medicines, and for ceremonial purposes. Kamakau (1992:409) reported "The king and Isaac of Pu‘uloa are getting rich by running the salt water into patches and trading salt with other islands." Thrum describes the how the ancient method of earth saltpans led to the salt works of Kamehameha IV in Kaka‘ako (Thrum 1924:116).

In the testimony for LCA 1903, Lolopi claimed four separate types of salt features: The ponds near the shore that fill with salt water at high tide (*ālia*); the drains where the salt water is transferred to smaller clay-lined or leaf-lined channels (*ho‘oliu*); the natural depressions (or modified depressions) in the rocks along the shore where salt formed naturally (*poho kai*); and the land that could probably not be used for agriculture as it was impregnated with salt (*kula*).

The export of salt declined in the late nineteenth century (Thrum 1924:116). By 1916, only one salt works, the Honolulu Salt Co., was still in operation. Salt continued to be manufactured for local use; the Kaka‘ako Salt Works appears on maps as late as 1891 and a page in Victoria Ward's ledger for 1883 notes a yearly income of $651.50 received from her "Salt Lands" in Kukuluāe‘o (Hustace 2000:50). A 1902 photograph (Figure 15) shows the extensive salt beds of the Kewalo area.

By 1901, government agencies reported that most of the fishponds and salt pans *makai* of the Ward "Old Plantation" area were abandoned. In that year, the Hawai‘i Legislature (1901:185) proposed to build a ditch to drain away the "foul and filthy water that overflows that district at the present time:"

> The district makai of King St. and the Catholic Cemetery, Ewa of Mrs. Ward's (the Old Plantation), *mauka* of Clayton St., and Waikiki of the land from King St., leading to the Hoomananaauao Church, consists of six large abandoned fish ponds and a large number of smaller ones, all in filthy condition, fed by springs and flowing into Peck's ditches. Just makai of these ponds, at the end of Clayton street, next to Mr. Ward's, is Peck's place. An artesian well flushing the wash houses flows into two foul ditches, thence to the big pond which is Waikiki of what used to be Cyclomere and next to Mrs. Ward's line [ditch] extending down to Waimanu St. The rear portion of Mrs. Ward's property down to Waimanu St. used to be fish ponds all connecting to the sea by a ditch which is fed by an artesian well. These ponds, with the exception of three, are abandoned.

Figure 13. 1838 sketch of "Honolulu Salt Pan, near Kakaʻako" drawn by a French visitor, Auguste Borget (original sketch at Peabody Essex Museum, Salem, Mass; reproduced in Grant et al. 2000:64-65)

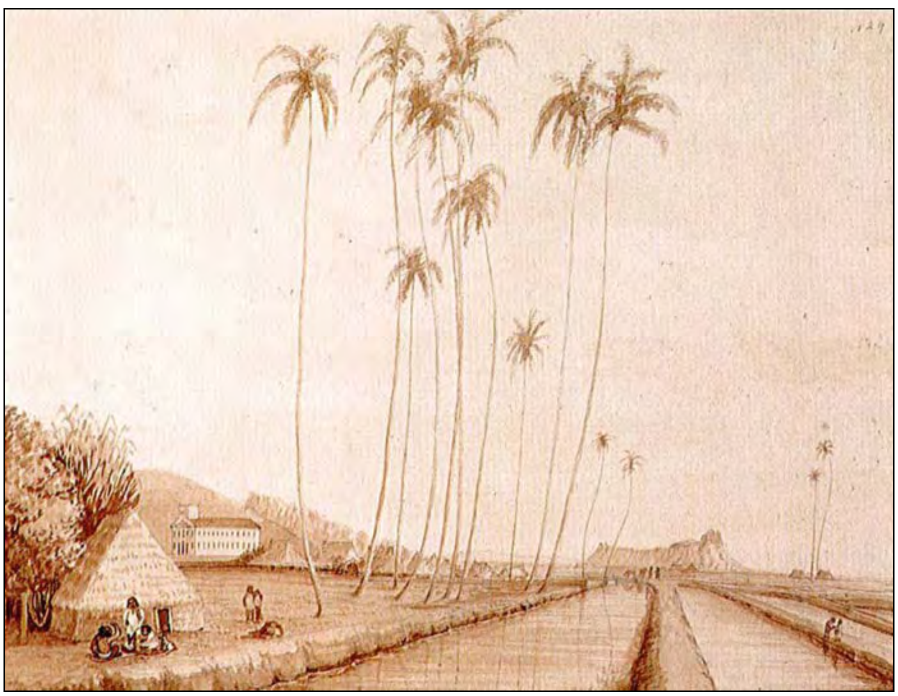


Figure 14. 1845 sketch of "Native Church [Kawaiahaʻo Church], Oahu, from the Old Salt Pans," drawn by John B. Dale, from the U.S. Exploring Expedition led by Lt. Charles Wilkes (J. Welles Henderson Collection, reproduced in Forbes 1992:126)

Figure 15. 1902 photograph of Kewalo Brine Basins; the Kakaʻako salt works may have extended back to pre-Contact times and are shown here going strong in 1902 (Scott 1968:579)

4.3 Human and Animal Quarantine

During an 1853 smallpox epidemic, patients were isolated at a temporary quarantine camp in Kakaʻako (Thrum 1897:98), and victims of the disease were buried at the Honuakaha Cemetery, near the junction of Quinn and South streets (Griffin et al. 1987:13). Hansen's Disease, commonly known as leprosy, was first reported in 1840 and definitively identified in 1853. In 1865, a receiving hospital in Kalihi was set up to examine suspected lepers. If the disease was confirmed, the patients were forcibly exiled to the Kalaupapa colony on Molokaʻi. In 1881, a branch hospital or receiving station for cases of Hansen's Disease was opened in Kakaʻako, in a block now bound by Ala Moana, Auahi, Coral, and Keawe Streets, under the direction of the Blessed Mother Marianne Cope (Griffin et al. 1987:55) (Figure 16). In 1888, the Hawaiʻi Board of Health decided to close the branch, moving the receiving station to Kalihi, and determined that "The buildings at Kakakao should be entirely removed" (Hanley and Bushnell 1980:275). However, Thrum (1897:101) reports that victims of the cholera epidemic of 1895 were treated at the Kakaʻako Hospital, so the buildings must have remained or been rebuilt. In 1899, the first case of bubonic plague was identified in Hawaiʻi, and spread rapidly through the crowded tenements of Chinatown. The government decided that the best way to eradicate the disease was through "controlled burning" of the wooden buildings. Infected patients were moved to a quarantine camp at Kakaʻako. Before new immigrants could travel to their new homes at the sugar plantations, doctors first examined them for disease. The Immigration Station was established in 1893 on Allen Street near downtown Honolulu, but it was moved to the Kakaʻako area in 1905. The station was built on mud flats, resting on a pile foundation; it was connected to the shoreline by two bridges (UH 1978:A-11).

Kakaʻako not only acted as a land set aside for human quarantine, but also for animal quarantine. The first animal quarantine station in the Hawaiian Islands was established in 1905. A veterinarian would check in all imported animals, checking for diseases such as cholera in hogs and tuberculosis in cattle. The workers added kennels to the facility in 1909 for the quarantine of all dogs brought to the islands. The animal quarantine station was on land rested from the Ward Estate, in the area between Kamakeʻe and Piʻikoi Streets. The 1913 report has a photograph of the "lethal chamber" where gas was used to euthanize "mangy and homeless" dogs (Hawaii Board of Commissioners for Forestry and Agriculture 1913:214). It is probable that the government also buried euthanized dogs at the station. The Ward family also donated some of their land to the society to establish the first animal shelter. This land was at the corner of Pohukaina and Kōʻula Streets; the facility for "all homeless, hungry animals" was completed in 1925. The Humane Society moved to a new and larger facility in Mōʻiliʻili in 1938 (Hawaiian Humane Society 1997:44, 53). As an area set apart for quarantine, other types of structures not suitable for construction near the center of town were built in Kakaʻako, such as a pump house, a kerosene storage lot for kerosene used in government buildings, and a garbage incinerator for the daily disposal of the city's refuse (UH 1978) (Figure 17).

Figure 16. Statue of the Blessed Mother Marianne Cope, who ran a Kaka'ako Branch Hospital for Hansen's disease patients, at the Kewalo Basin Park (CSH March 31, 2010)

R. J. Baker

DAY AND NIGHT—A COLUMN OF SMOKE

"The desert waterfront of Honolulu where there is a perpetual volcano," described this forsaken stretch of scrub covered coral wasteland between what would become the Ala Wai and Kewalo Basin. In the center of this desolation stood a refuse dump where, day and night, columns of smoke rose into the Hawaiian sky.

Figure 17. 1921 photograph of a City worker supervising open burning of trash understood as on the west side of Kewalo Basin (Original photograph by Ray Jerome Baker, reprinted in Scott 1968:578)

4.4 Military Infrastructure

During the monarchy, the waterfront of Kaka‘ako was the location for a battery with three cannons used to salute visiting naval vessels, which responded with their own cannon salutes (Figure 18). Other saluting batteries were at the top of Punchbowl Crater and at the Honolulu Fort (Dukas 2004:163), and these were used until the overthrow of the monarchy in 1893 (Judd 1975:57).

After the annexation of the islands by the United States in 1898, the U.S. Congress began to plan for the coastal defenses of their new islands. The major batteries were placed at Pearl Harbor and in Waikīkī, but a small reservation, named Fort Armstrong (Figure 19) was also set up on the Ka‘ākaukukui Reef as a station for the storage of underwater mines. In 1911, the Honolulu Rifle Association, and possibly other groups, used the flat, uninhabited Kaka‘ako lands near the coast as a rifle range. The militia probably chose this area for target practice based on the absence of any habitations in the area (Williford and McGovern 2003:15).

The fort saw some small action during World War I. The military authorities closed Honolulu Harbor between sunset and sunrise in October 1917. The steamer *Claudine,* which was sailing from Maui when the edict went into effect, sailed into Honolulu Harbor unknowingly after twilight. The coast artillery at Fort Armstrong shot a few shells across her bow, and the steamer quickly reversed her engines and went back out to sea, until the following morning, when she could safely and legally come to shore (Thomas 1983:147). During the Japanese attack on December 7, 1941, the fort escaped relatively unscathed; only one motor pool structure was hit. Antiaircraft shells were fired from the fort, but were ineffective; at least one hit the town rather than any aircraft (Richardson 2005:34). In the 1950s, the federal government returned most of Fort Armstrong to the Territory of Hawaiʻi, which used the area to expand the shipping piers of the harbor.

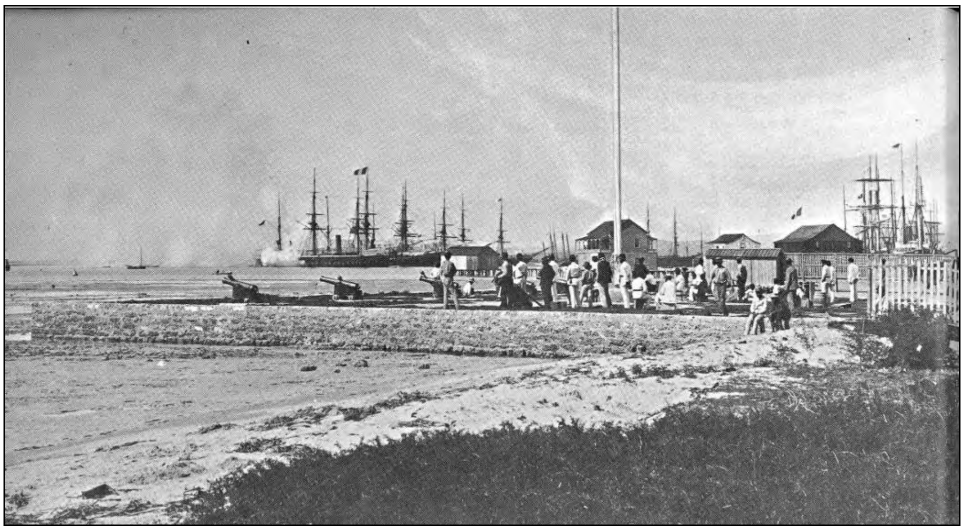


Figure 18. 1887 photograph of the Kakaʻako Saluting Battery and flagstaff (original photograph taken by Karl Kortum and archived at the San Francisco Maritime Museum; reprinted in Scott 1968:176)

Figure 19. Colorized postcard (ca. 1911-1920) of Fort Armstrong (Original black and white photograph at Hawaiʻi State Archives; reprinted in Wisniewski 1984:18)

4.5 Dredging and Reclamation

The late nineteenth and early twentieth centuries were an area of intense development of the Honolulu and Waikīkī coasts. A number of reclamation projects involved the dredging of offshore areas to deepen and create boat harbors, and using the dredged material to fill in the former swampy land. The first efforts to deepen Honolulu Harbor were made in the 1840s. The idea to use this dredged material, composed of sand and crushed coral, to fill in low-lying lands, was quickly adopted. The first areas to be filled were those areas closest to Honolulu town, then the lands toward Kakaʻako (Griffin et al. 1987:13).

An 1887 photograph (Figure 20) of the Kawaiahaʻo Church shows in the background (Figure 21) the marshy nature of the area prior at the beginning of the dredging and reclamation, with only scattered houses near the ponds or near the shore *makai* of Kawaiahaʻo Church (Hawaiʻi State Archives, reprinted in Stone 1983:84-85). By the mid-1880s, filling-in of the mud flats, marshes, and salt ponds in the Kakaʻako and Kewalo area had begun. The first fill material may have been set down for the Kakaʻako Leper Branch Hospital (between Coral and Keawe Streets), which had been built on a salt marsh. Laborers were hired to "haul in wagonloads of rubble and earth to fill up that end of the marsh" (Hanley and Bushnell 1980:113).

According to Nakamura (1979), the main desire to fill in the lands of Honolulu, Kewalo, and Waikīkī was to provide more room for residential subdivisions, industrial areas, and finally tourist resorts. In the early part of the twentieth century, Kakaʻako was becoming a prime spot for large industrial complexes, such as iron works, lumber yards, and draying companies, which needed large spaces for their stables, feed lots, and wagon sheds. In 1900, the Honolulu Iron Works, which produced most of the large equipment for the Hawaiian plantation sugar mills, moved from their old location at Queen and Merchant Street near downtown Honolulu to the shore at Kakaʻako on land that had been filled from dredged material during the deepening of Honolulu Harbor (Thrum 1901:172).

Although the Board of Health could condemn a property and the Department of Public Works could then fill in the land, the process was rather arbitrary. In 1910, after an epidemic of bubonic plague, the Board of Health condemned a large section of Kewalo, consisting of 140 land parcels (including areas once known as Kukuluāeʻo and Kaʻākaukukui), which had numerous ponds (Hawaiʻi Department of Public Works 1914:196). The first land to be filled in was the portion of the Ward Estate's Kukuluāeʻo property west of Ward Avenue, completely filled in by June of 1913. By August 1913, the rest of the Ward Kukuluāeʻo lands west of Ward Avenue had been completely filled; and by February 1914, all of the land from South Street to Ward Street, and from Ala Moana to Queen Street, had been filled (Hawaiʻi Department of Public Works 1914:198).

Prior to dredging, Kewalo Basin was a natural deep pocket in the reef seaward of Ala Moana Boulevard between Ward Ave and Kamakeʻe Street (Figure 23) that had been used as a canoe landing since pre-Contact times and probably used since the early historic period as an anchorage. In 1919, the Hawaiʻi Government appropriated $130,000 to improve the small harbor of Kewalo—now the Kewalo Basin Harbor—for the aim of "harbor extension in that it will be made to serve the fishing and other small craft, to the relief of Honolulu harbor proper" (Thrum 1920:147). The basin was initially made to provide docking for lumber schooners, as the area chosen for the harbor area was adjacent to several lumber yards. Dredging of the Kewalo Channel began in 1924, but by the time the concrete wharf was completed in 1926, the lumber import business had faded, so the harbor was used mainly by commercial fishermen (Figure 24). In 1941, the government dredged and expanded the basin to its current 22 acres. In 1955, workers placed the dredged material along the *makai* side to form an eight-acre land section protected by a revetment—now the Kewalo Basin Park (Kewalo Basin Harbor 2009).

Southeast O'ahu was transformed when the construction of the Ala Wai Drainage Canal resulted in the draining and filling in of the remaining ponds and irrigated fields of Honolulu and Waikīkī (Figure 26 to Figure 27) The canal was one element of a plan conceived in 1906 to urbanize Waikīkī and the surrounding districts. The final result of the project, begun in 1921, was a "canal three miles long, with an average depth of twenty-five feet and a breadth of two hundred fifty feet" (*Honolulu Advertiser* 1928:2,16). The first phase of construction was to dig a canal parallel to the coast along Waikīkī Beach. The dredged material was placed on adjacent properties from McCully Street to Kapiʻolani Park. This action affected several private land owners, including the Bishop Estate and the Booth Estate. The second phase of construction was to dredge a canal from the beach towards the reef. Construction workers pumped the dredged material to the new McKinley High School site, an area of former large ponds adjacent to the eastern boundary of the *mauka* portion of the Ward Estate (Hawaii Governor 1922:49-50). Additional dredged material was used to fill the area *makai* of the school grounds in 1930 (Hawaii Governor 1930:74).

Figure 20. Photograph of Kakaʻako area, ca. 1887; Honuakaha settlement at lower right across from Kawaiahaʻo Church at left center; Kukuluāeʻo coastal marsh lands in upper right background (Original photograph at Hawaiʻi State Archives, Henry L. Chase Collection; reprinted in Stone 1983:84-85)

Figure 21. Inset of above photograph (right upper corner), showing sparsely-settled, marshy shore area of Kukuluāeʻo (now Kakaʻako)

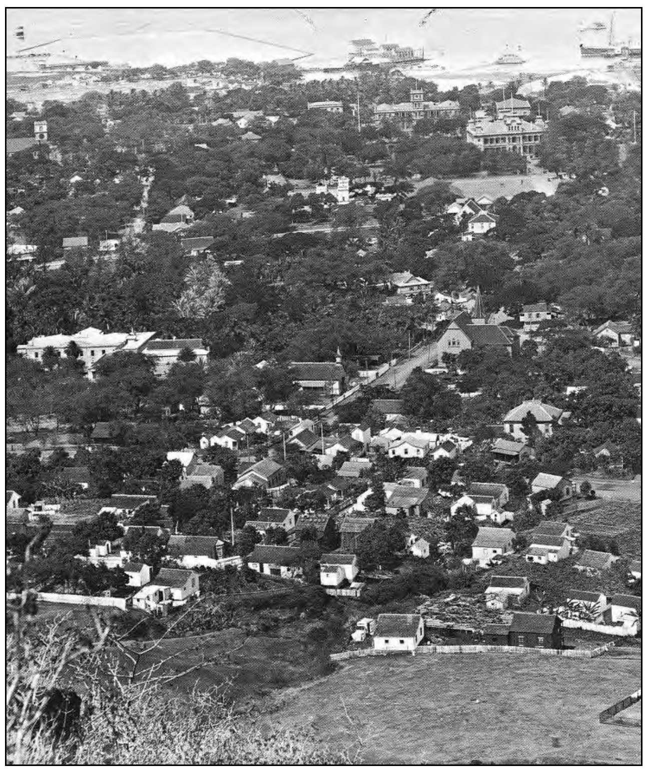
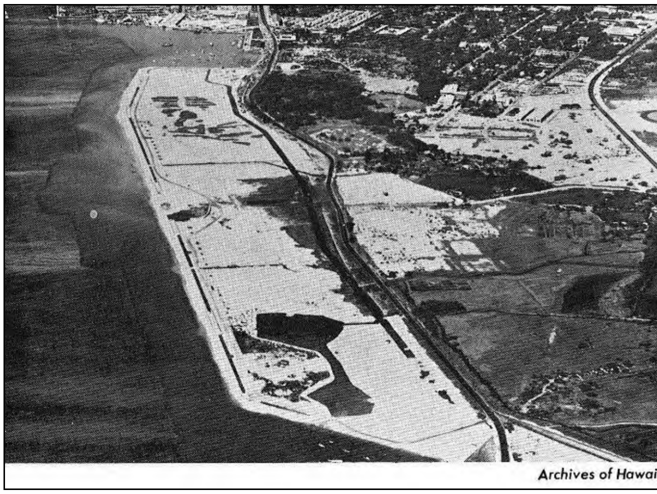


Figure 22. 1894 photograph of the Honolulu waterfront taken from the top of Punchbowl (Kawaiahaʻo Church and ʻIolani Palace are clear landmarks); seaward land reclamation with a new seawall is quite pronounced at the upper left (Original photograph at Hawaiʻi State Archives; Scott 1968:266).

Figure 23. 1927 aerial photograph showing the natural deep pocket in the reef (just prior to dredging) and the brand new and in-progress land fill on the west side; A very narrow strip of sand is shown between the narrow beach road and the reef (Hawaiʻi State Archives)

Figure 24. Aerial photograph of Kewalo Basin, about 1930 (left foreground) (Hawaiʻi State Archives)

Figure 25. 1931 aerial photograph, showing dredged materials (white crushed coral) used in the construction of Kapiʻolani Boulevard and used for fill in marshy areas of Honolulu and Waikīkī (Hawaiʻi State Archives)



AT THE DREDGING STAGE

Ala Moana Park was a vast table of white sand when this view was taken by the Army Air Corps on November 1, 1932, from 2000 feet. The photograph points out the filling accomplished by the Hawaiian Dredging Company. There was now more than a mile long build up of sand from the ocean floor covering the scrub covered salt water marshes. Kewalo Basin appears at the top of the picture with Ala Moana Boulevard snaking along the edge of the old tidal flats. Already completed are the lagoons within the park.

Figure 26. 1932 aerial photograph of the creation of Ala Moana Beach Park in 1932 including the east side of Kewalo Basin from dredge spoils (Original photograph at Hawaiʻi State Archives, reprinted in Scott 1968:578)

Figure 27. 1950s photograph of dredge boats between Ala Wai Yacht Club (right foreground) and Kewalo Basin (left background); also note coral fill (white) area on land where the future Ala Moana Shopping Center will be built (Hawaiʻi State Archives)

4.6 *Sampan* and *Aku* Fishing

At the dawn of the twentieth century, a single Japanese style fishing vessel entered Hawaiian waters. Hans Van Tilburg (2007) describes the story of how this singular event led to the commercial *aku* (bonito, skipjack) fishing industry in Hawaiʻi. Gorokichi Nakasugi, a Japanese shipwright and fisherman from Wakayama prefecture in southern Honshu, arrived by steamer in Hawaiʻi in 1899 as part of a Pacific-wide labor migration. Mr. Nakasugi brought with him on the deck of the steamer a traditional 34-foot Japanese sailing *sampan*. The term *sampan*, like junk and dhow, vaguely connotes a type of vessel used by several Asian cultures. Originally from the Chinese language, meaning three (*san*) boards (*ban*), the term refers to a small simple skiff, while in Hawaiʻi the term implies some kind of Japanese influence. Large-scale Japanese shipbuilders had been encouraged by the Meiji government in 1868 to reform their construction practices, but the older maritime traditions of small boatbuilding survived among Mr. Nakasugi's homeland in the southern Japanese islands. Mr. Nakasugi's *sampan* featured a wooden hull and a light square-sailed rig, and these were reminiscent of older Japanese fishing vessels with distinctive keels, planking, and bulkheads (Van Tilburg 2007:41-42)

Through Mr. Nakasugi, traditional Japanese ship features were imported from southern Honshu to the rough open waters around the Hawaiian Islands. With continuing labor migration, Japanese vessels and their sailors found employment in the offshore fishing industry, soon unloading large catches of *ahi* (yellow-fin tuna) and *aku* on the docks of Kewalo Basin. The Japanese fishermen opened the commercial tuna industry in Hawaii in conjunction with the innovation of modern packing plants, and this enabled the expansion and modernization of the fishing fleet (Van Tilburg 2007:42). Several classes of *sampan* emerged—*aku* boats operating 30 miles offshore with live anchovies as bait, *ahi* boats operating thousands of miles away with *aku* used as bait to catch ʻōpelu that in turn is used as bait to catch *ahi*, and *akule* (big-eyed scad fish) boats operating along the coast with live shrimp as bait (Gessler 1937).

The small boat harbor of Kewalo Basin was developed in the 1920s to prevent the growing *aku* fishing fleet from overcrowding Honolulu Harbor (Kewalo Basin Harbor 2009). About 50 *sampan* used to congregate in the harbor near the River Street fish markets. The Hawaiian Dredging Company completed the Kewalo Basin wharf and channel in 1925, and all ships of the *aku* fishing fleet relocated to Kewalo Basin by 1930. The McFarlane Tuna Company (now Hawaiian Tuna Packers) built a shipyard there in 1929 for their fishermen's *sampan* fleet (Figure 28) and a new tuna cannery at the basin in 1933 (Clark 1977:64). The *aku* and *ahi* from the *sampan* fleet was processed as tuna in tins:

> The sixty-five sampan belonging to the company tie up at the company wharf and unload into steel-bottom slatted cars on a narrow gauge railway. Weighed in the cars, the fish are cleaned on a concrete floor and cooked, a ton or two at a time, in steam-jacketed cookers. After three hours in the cookers, it takes them ten hours to cool before they are stripped and sliced, oiled and sterilized, and cooled again (Gessler 1937:185).

The *sampan* were usually painted blue, a lucky color, and fortunately a cheap paint color. The first boats were powered with sails, but Japanese-trained shipwrights fitted gasoline engines into the vessels around 1905, which were replaced with diesel engines by 1927 (Van Tilburg 2007:42). The shipwrights adapted the original *sampan* design to the rough waters of the Hawaiian Islands by sharpening and heightening the prow, increasing the length to 80 feet, and heightening the house amidships for spotting fish (Krauss 2006). By 1940, the number of *sampan* in Hawaiʻi had increased to over 450, making the commercial fishery the third largest industry behind sugar and pineapple. However, the *sampan* relied on live *nehu* (anchovies) for bait and very few of these anchovies survived the tossing from rolling swells. In addition, canneries on the mainland U.S. had already switched to purse seining, eventually bringing in 20 times more *aku* than the Hawaiian industry. Schools of *aku* in the clear waters of Hawaiʻi can easily avoid the huge nets of purse seining. As a result, the *aku sampan* of Hawaiʻi were stuck with a traditional live bait, pole-and-line method of fishing (Figure 29) (Van Tilburg 2007:43).

Growing international tensions between Japan and America in the 1930s brought increased scrutiny to the *aku* fishing fleet in Hawaiʻi. Many of the larger powered *sampan* were over 80 feet in length and ranged as far as 1,500 miles. Military planners feared that Japanese nationals had almost complete control over this fleet, as these foreign vessels observed few, if any, regulatory restrictions within the domestic fishery. Establishing control over the Japanese fishermen and their fleet was a major issue for the U.S. Navy. By 1940, immigration officials had deported many crew members to Japan and confiscated their fishing *sampan* (Van Tilburg 2007:43).

World War II severely impacted the *sampan* fishing industry. Economic sanctions limited the operating of *aku sampan* to certain hours in a few near-shore areas, and this devastated the fishing industry by reducing the annual yield by 99% in 1942. The government confiscated the *sampan* fleet in groundless fear that the mainly Japanese owners would use the boats for spying or sabotage. The blue paint of the *sampan* were covered with white, and the boats were converted for use as coastal watch vessels. The Japanese were banned from offshore fishing and some of the fishermen were interred in military camps. The U.S. military converted the cannery into an assembly plant for aircraft auxiliary fuel tanks. The days of the independent Japanese tuna fishermen in their *sampan* never recovered from the World War II confiscations. Wood shortages after the war prevented the construction of new boats, and the cannery reopened at only a quarter of its former capacity. The tuna fish cannery closed in 1985 when the industry became unprofitable (Van Tilburg 2007:44-45)

In 2003, only a few of the pre-war Japanese *sampan* in Hawaiʻi remained (*Kula Kai*, *Neptune*, *Orion*, *Corsair*, and *Sea Queen*), all of which were operated by mostly Hawaiians, local Koreans, and Micronesians. Overall, the Japanese designed *sampan* in Hawaiʻi are a unique class of vessels associated with the rise of the commercial fishing industry (Van Tilburg 2007:44). Now, the *Kula Kai*, built in 1947, is the only surviving vintage wooden *sampan* in Hawaiʻi and the last representation of a unique maritime culture (Krauss 2006).

Figure 28. Photograph of *sampan* at Kewalo Basin in the 1930s (Hawaiʻi Aviation 2010)

Figure 29. Photograph of Japanese *aku* fishermen using traditional live bait, pole-and-line method of fishing about 1930 (Original photograph at Hawaiʻi State Archives, reprinted in Winiewski 1984:93)

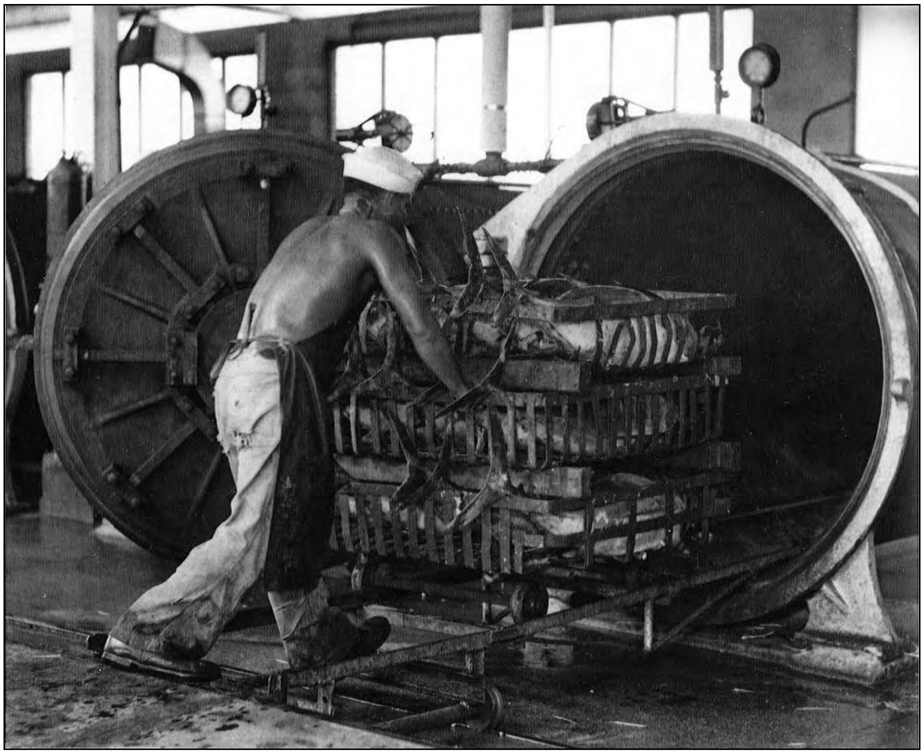


Figure 30. Photograph of racks of tuna at Hawai‘i Tuna Packers Cannery in Kaka‘ako about 1930 (Original photograph at Hawai‘i State Archives; reprinted in Kapono 2008:138)

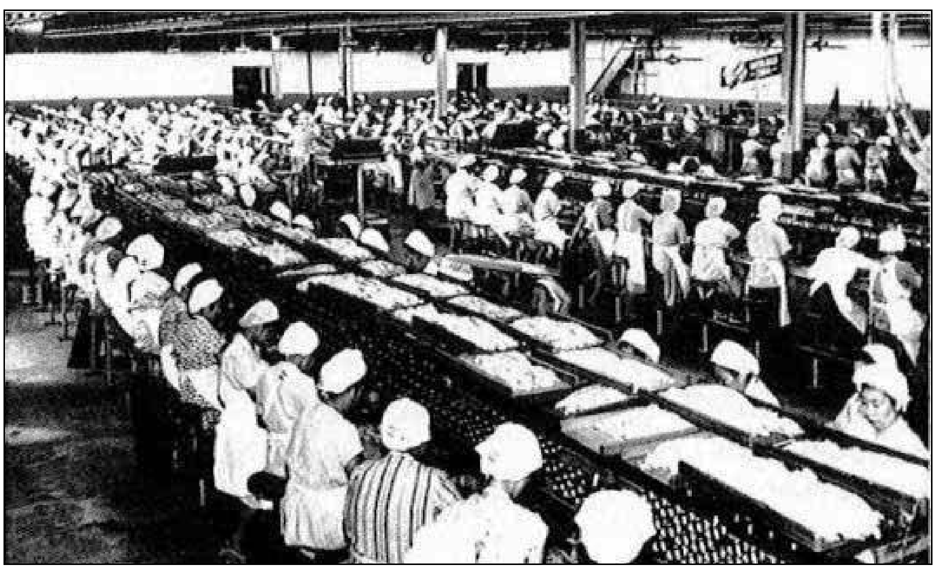


Figure 31. Photograph of workers canning fish at the Hawai‘i Tuna Packers Cannery in Kaka‘ako about 1930 (Original photograph at Hawai‘i State Archives; reprinted in Wisniewski 1984:93)

4.7 Urban Development

The 1884 Bishop map (see Figure 5) shows the nascent traces of the future development in the grid of roads stretching inland of the Kakaʻako district in the late nineteenth century. Kakaʻako was considered to be outside the formal boundary of Honolulu proper and was used in the mid-to-late nineteenth century for cemeteries, burial grounds, and the quarantine of contagious patients. In the early twentieth century, the Hawaiʻi government used Kakaʻako as a place for sewage treatment and garbage burning, then for cheap housing and commercial industries (Griffin et al. 1987:13).

During the first half of the twentieth century, both rice fields and marshlands in Kakaʻako lands were filled to accommodate the expanding urbanization of Honolulu. An 1887 map surveyed by W. A. Wall (Figure 32) shows a corridor of streets extending diagonally from Honolulu Town, including Queen Street that was planned to connect with the beach road to Waikīkī. The Queen Street alignment appears to follow the route of the traditional trail from Kou (Honolulu) to Waikīkī described by John Papa ʻĪʻī. As noted above, this trail likely ran on a sand berm raised above the surrounding marshlands and coral flats. The location of the northern boundary of the Kakaʻako District immediately adjacent to the trail/Queen Street corridor suggests that at least the *makai* portion likely comprised a sandy dryland environment in the traditional Hawaiian landscape.

A settlement of poor people, mainly Native Hawaiians, inhabited the area around Kewalo Basin during this time period (Figure 33). In the 1920s, on the east side of Kewalo Basin, they congregated near a camp named "Blue Pond," named after a large and deep pond near the shore. On the west side of the basin, in the Kaʻākaukukui area (shortened to ʻĀkaukukui), they lived in shacks and sturdy houses in an area called "Squattersville," named because they illegally lived without authorization on government land. This camp was generally around Olomehani Street near the shore, protected from the waves by a long sea wall. There were around 700 Hawaiians and part-Hawaiians living in these two camps in the mid-1920s, but by 1926, they were all gone. The government evicted the families and razed the houses (Clark 1977:64). Clark further reports on the developments in the area after the demise of Squattersville:

> During the 1930's and 1940's, the Kaʻākaukukui area continued to be heavily utilized as a fishing and swimming area, especially by children from the neighboring community of Kakaʻako. The children surfed on redwood planks in the break they called "Stonewall." Many varieties of fish were abundant. Younger divers were warned by the old-time residents to stay away from the large shark hole on the Waikīkī side of Kewalo Channel. Many people came to this area to pick limu [seaweed] and wana [sea urchins], and also to catch squid on the shallow reef. (Clark 1977:64)

A 1927 U.S. Geological Survey map (Figure 34) shows the first buildings of the new McKinley High School campus and illustrates that the eastern portion of the Kakaʻako District was still undeveloped. On a 1943 U.S. War Department map (Figure 35), the eastern portion of the Kakaʻako Area District was an area of open lumberyards and large warehouses. After World War II, Kakaʻako became increasingly industrialized, and residents moved out to the newer subdivisions away from the Honolulu central area. The 1943 map is the first to show the newly developed Kewalo Basin.

Around this time, the open areas of Kakaʻako were in the process of being filled with material dredged from the Ala Wai Canal, Ala Moana Beach Park, and Kewalo Basin, and with material from the city incinerator at the Kewalo coastline. The City and County constructed a massive seawall along the edge of the Kewalo Channel, and the subsequent filling operations completely covered the shallow reef of Kaʻākaukukui and added 29 acres of new land to the old shoreline (Clark 1977:64). By the mid-twentieth century, the Kakaʻako area was completely filled.

In the 1960s, the explosive growth of surfing in Waikīkī forced many surfers to explore and discover uncrowded breaks, including the waters of Ala Moana Beach Park and Kewalo Basin. The eastern end of Kewalo Channel was called "Shark Hole" after the inhabitants of the area and the western section was called "Point Panic," as the surf rolls directly into the newly constructed seawall (Clark 1977:64).

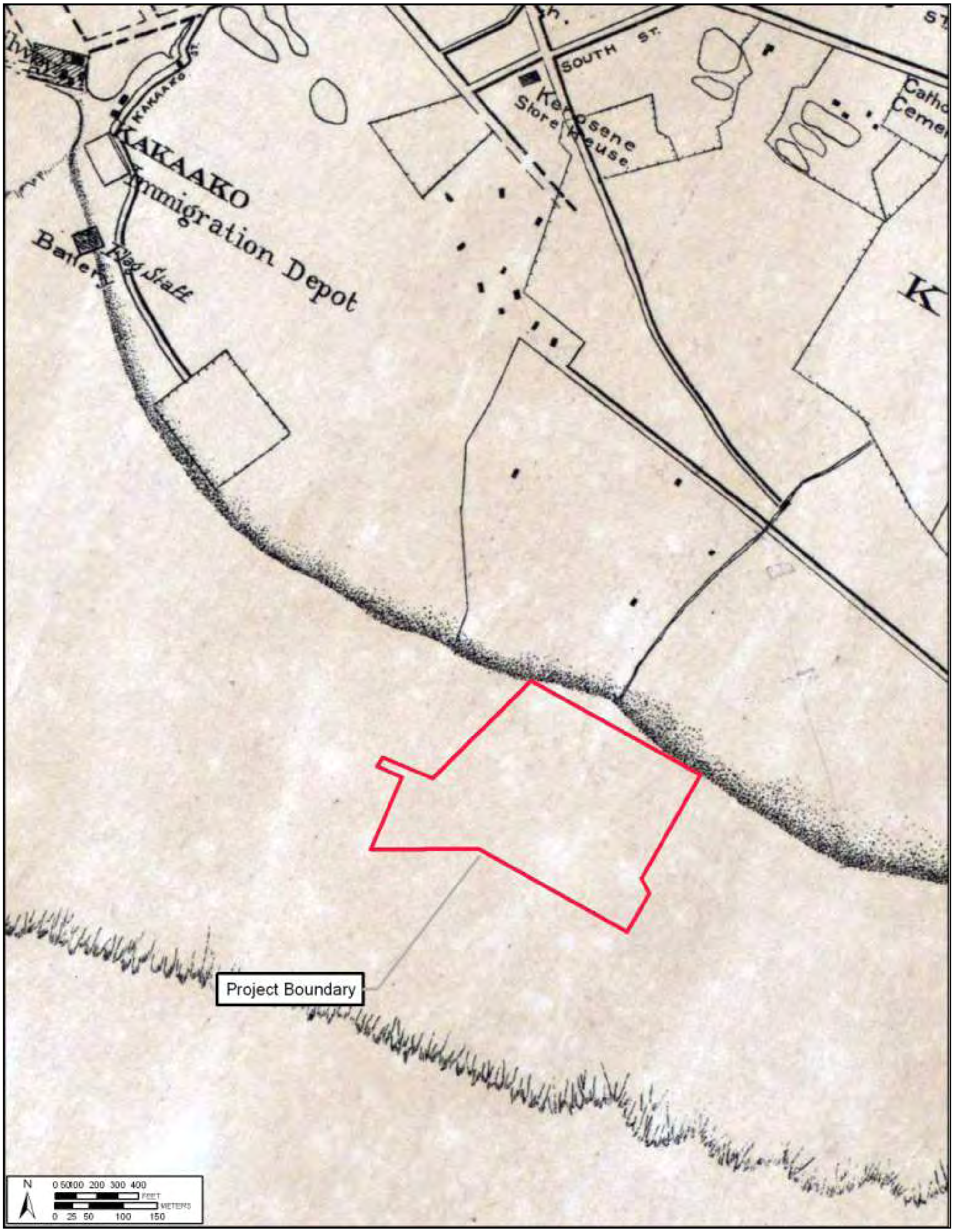


Figure 32. Portion of 1887 map of Honolulu and Vicinity by W.A. Wall, showing lack of road and residential development in the Kakaʻako area in the late nineteenth century

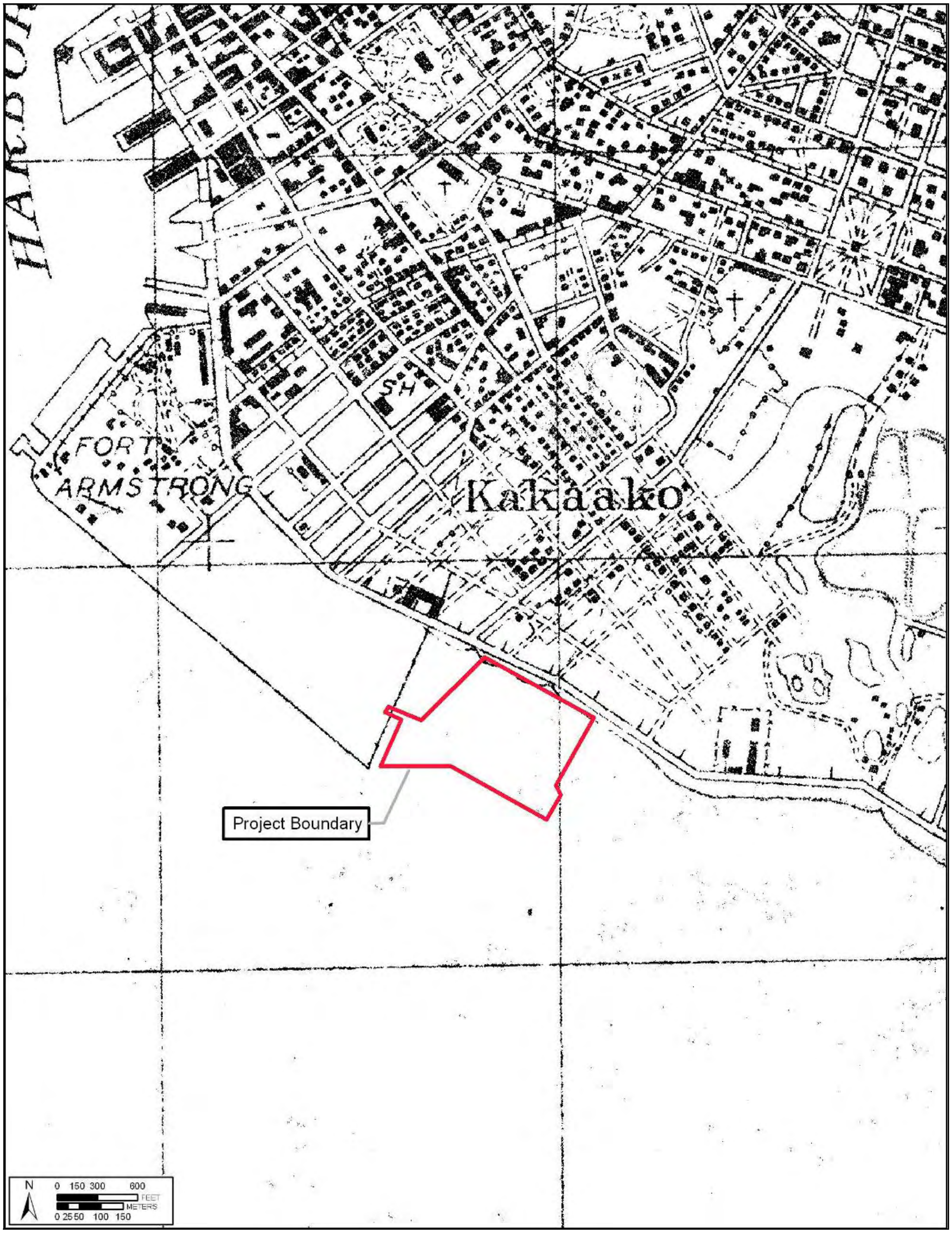


Figure 33. Portion of 1919 U.S. War Department Map (Honolulu Quadrangle), showing development of residential areas in Kakaʻako

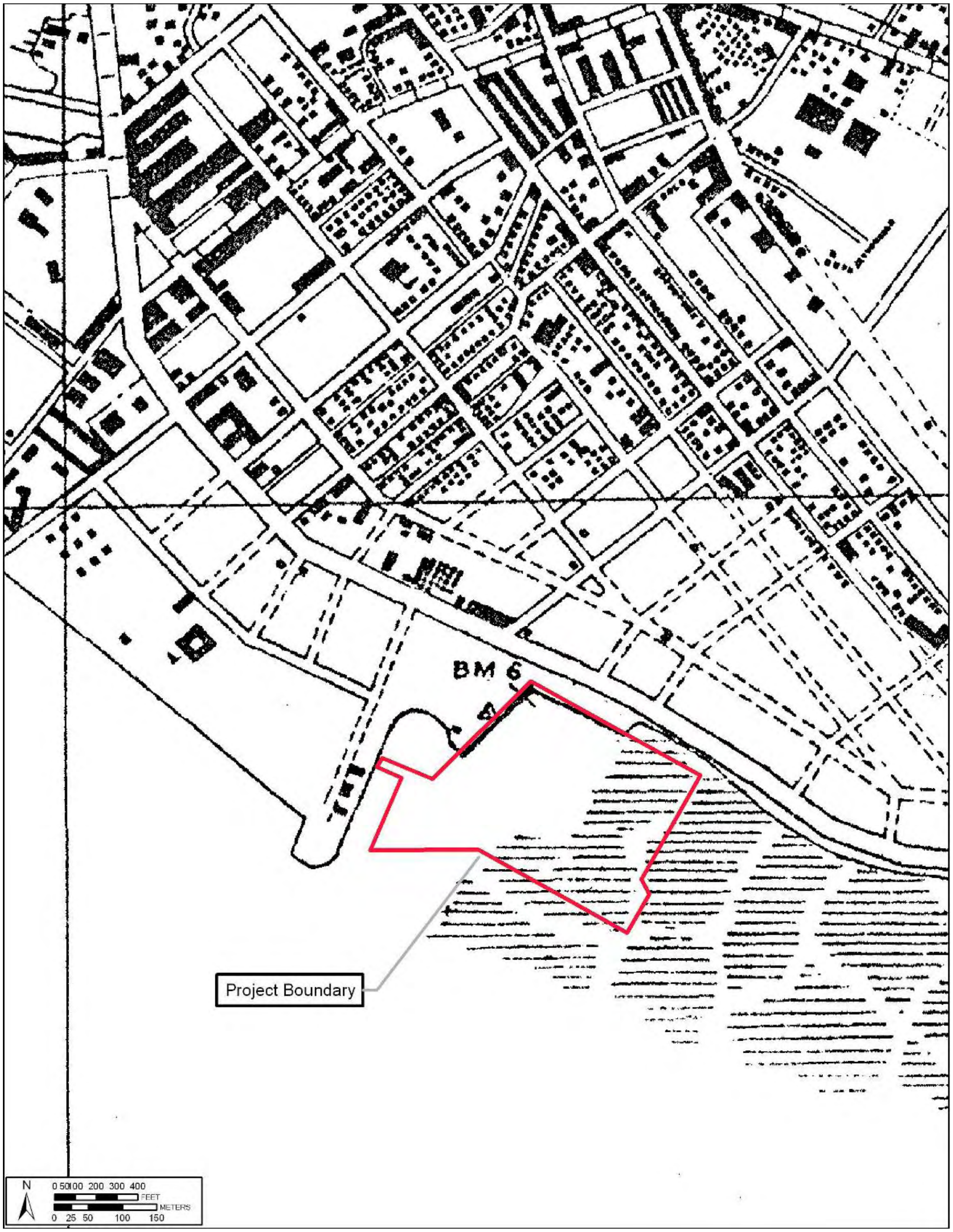


Figure 34. Portion of 1927 USGS topographic map (Honolulu Quadrangle), showing development of residential areas in Kaka‘ako

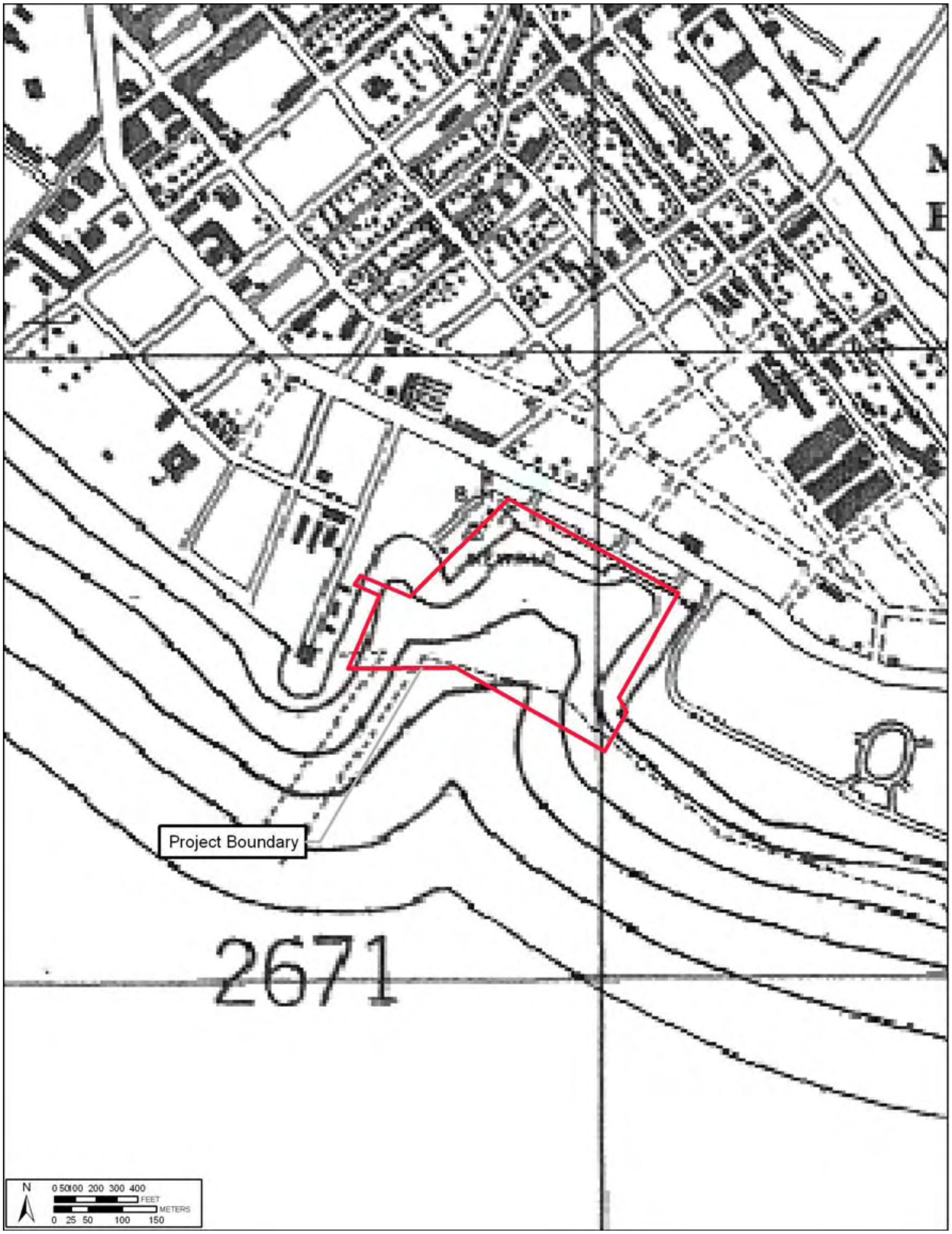


Figure 35. Portion of 1943 USGS topographic map (Honolulu Quadrangle), showing development of residential areas in Kaka‘ako

Section 5 Previous Oral History Research

There have been a number of oral history projects conducted with residents of the Kaka‘ako district. Most notable is a two-volume report by the University of Hawai‘i’s Ethnic Study Oral History Project (1978), called *Remembering Kaka‘ako 1910-1950* that documents the lives of the “unsung heroes” of Kaka‘ako—the machinists, firemen, cannery workers, and others from diverse ethnic backgrounds that have shaped the history of Hawai‘i (UH 1978:ix). Many of the interviewees were of Japanese descent, and most of their fathers were fishermen who settled in Kaka‘ako to have access to the waterfront. The following sections highlight the voices of two deceased people who were intimately involved in the maritime activities of the Kewalo Basin at the dawn of the twentieth century—Usaburo Katamoto (UH 1978:534-632) and Keisuke Masuda (UH 1978:817-876).

5.1 Usaburo Katamoto

Usaburo Katamoto, a retired boat builder, moved to Kaka‘ako from Japan in 1910 at 14 years of age to follow his father, a boat builder who had first come to Hawai’i in 1904. Mr. Katamoto’s father learned the trade under a traditional apprenticeship system, and had extensive sailing experience in Japan. Mr. Katamoto, who learned from his father after he moved to Kaka‘ako, gained extensive knowledge of the *aku sampan*. He related the origin of the *sampan* in Hawai‘i:

> Those days [1904] only small boat…24, 28-feet long, you see. That’s the Japanese type—sculls—oars, instead of an engine’s power. Only one-man affairs. I mean, only the boat building. And, he takes over and finishes himself. And when launching time come, all the boat owners get together and help ‘em carry out to sea. Just dump ‘em in the water. That was process in those days. Then, around, when the fishermens from Japan, he brought 36 foot boat. He brought ready-made boat on the steamship. He didn’t—there was no way to build a boat then, in Hawaii, so he bought the boat and tried to do fishing right off the entrance from Honolulu Harbor till Pearl Harbor. That’s where they used to catch *aku*. They used to use a scull or the sail. After that, they tried to use a power. (UH 1978:609)
>
> In Kakaako area, mostly like fishermen. The fishermens used to live in Kakaako. Majority. These *aku* boat fishermens that came from a certain district of Japan [Wakayama] was living in town. The reason why ‘cause some of the boat was allowed in main harbor. In Honolulu main harbor…in those days now Aala Market used to be water. Boat was tied up to the King Street… and most fishing boat was not allowed in main harbor. And those guys lived in Kakaako area, hauled that small boat (and) switched over to Kewalo Basin. So, they was forced to build a small pier. And they all built this catwalk like, you know, with wooden construction. (UH 1978:545)

Mr. Katamoto explained that the Japanese fishermen catch several kinds of fish, notably *aku* and *ahi*. In the following notes, Mr. Katamoto captured a scene of the early sailing *sampan*:

> Mr. Katamoto talked about the 35 to 36-foot *aku* boats which were operated by 6, 7, or 8 men, sailing in the fair wind off the harbor entrance or at Pearl Harbor.

> They didn't have to go far for big catches. He related that catches were so good that sometimes they were just dumping fish off Diamond Head because they couldn't sell them all. (UH 1978:536)

Mr. Katamoto's father's built 30- to 35-foot boats at the end of Punchbowl Street. Mr. Katamoto expanded the family boat building business and worked with Hawaiian Tuna Packers at the Kewalo Basin dry dock. Mr. Katamoto recalled that he used to dray the newly built vessels with a team of a dozen mules, but he moved his business to Kewalo primarily for ease of launching the boats into the shallow water:

> …when I move the shop from Kakaako Street to Kewalo, that's where I move the shop. I move to Kewalo, then I build the boat right in front the water, waterfront. And put them (boats) on the carriage, which is operate by radio. Portable radio. That's dry dock business. We used to call 'em Kewalo Marine Radio Works" instead of a dry dock. That's why I moved into Kewalo. Instead of carrying long ways, eh. You spend six months and lots of money, and carry that carriage, put 'em on the rail and just shoot 'em in the water. Yeah. That one reason why I move. (UH 1978:578-579)

Mr. Katamoto recalled a customary Japanese celebration to memorialize the launching of newly built boat:

> They customary, they celebrate even they don't have any money. All the friends do it for them anyway, you know. They start make mocha, eh. The rice cake. They throw that for good luck. Sometimes they put prizes in the cake itself. They get good prizes…And, we builders, they throw us in the water… (UH 1978:613)

In 1924, Mr. Katamoto moved his boat building business to Kewalo Basin, the same year that it was being dredged. He described the size of boats the harbor could accommodate:

> [Tuna Packers] that's where they can unload their fish from the fishing boat right into the plants…That's when I move down to Kewalo when they got a small marine way to hold the small boats up was there. But it wasn't big-scale. Just a small-scale and it's just handles the small boat only. Around about, well, say about 50 feet. There wasn't very big boat at that time in Kewalo Basin. As I said, the place was shallow and they cannot get in there rough day. When sea got rough they cannot enter to the place. And when the tide is low the 50-foot boat cannot go in. Only the small 30- or 40-foot boat. So their aim was just a small boat at that time. And after Tuna Packers took over, they enlarge that marine way. (UH 1978:617)

Mr. Katamoto recollected the dredging of the area to make Kewalo Basin and Ala Moana Park, an area once used for salt making:

> Used to be salt field. You know, Chinese had the salt field there. High tide come, the put the sea water go in. And shut the gate. And throw the sea water on the field and make it dry. And then rake it up and put 'em in the trough like, you know. Make the salt water richer (dried in the field, more concentrated). How they make that Hawaiian salt. (UH 1978:622)

5.2 Keisuke Masuda

Keisuke Masuda, a former foreman with Hawaiian Tuna Packers at Kewalo Basin, was born in 1901 in Japan, and after his father emigrated to Hawaiʻi in 1908, Mr. Masuda rejoined his parents in 1915. His father started a fishing business at the Kakaʻako waterfront, but fishing did not interest Mr. Masuda so he trained to be a machinist and mechanic. After the depression hit in 1929, Mr. Masuda gained employment at Hawaiian Tuna Packers in 1931, where he worked the night shift as foreman until the start of World War II in the Pacific in 1941. Mr. Masuda was responsible for unloading the fish from the boats, weighing the fish, operating the boiler, steaming and cleaning the fish, pressure sealing the fish in cans, and packaging the canned tuna. Mr. Masuda remembered that Kakaʻako was full of Japanese fishermen. He described the scene at the docks of Kewalo Basin when the *aku* boats returned:

> …The boat come in nighttime mostly, see, so somebody have to sit there to receive the fish, ʻcause they have a contract, you know, and the fishing boats and the cannery had a contract. So, whatever (fish) market cannot take, they bring all to the fishing cannery. (UH 1978:829)

> …Well, during the cannery season, actually they start around May, June, July, August, September. Was about five months is the most *aku* season, see, when they catch plenty. Aku coming in. So somebody have to stay nighttime. You don't know when the boats come in, see. Sometime the boats come in about 1, 2 o'clock in the morning, see. So when the boat come in late, I have to go call—mostly Filipinos, see—to clean the fish. Have to clean the fish, and wash it, and then put ʻem in a tray, stack ʻem up about, oh, about six or seven in a tray, they put ʻem. Then put ʻem in car, and put ʻem in the boiler, where they cook the fish. Steam the fish in it. They have so many boilers, see. So I have to call some help, eh. (UH 1978:831)

One of the challenges Mr. Masuda faced was finding five to six workers to clean the fish. This transient crew, mostly Filipino, slept off-site. When the boats arrived, Mr. Masuda only had a few hours to unload the fish before they spoiled, so he rode his bicycle to the places where the crew slept and he enlisted their help, often forcibly. Mr. Masuda described the process of cooking and cleaning the fish:

> They just, you know, get the knife. We have a big table like this, see. And then the fishes are all on the ground, now. Pull it up, hold the tail, just open the belly, and take the guts out, see. They leave heads… Only take the guts out. And then, throw ʻem in a big box, where they had a full water and wash it in there. Some guys, they wash, they put ʻem in a tray. Some guys do only cutting. So we had to have quite a many help, not only the cutters, see. So they put ʻem in the tray, and then, push ʻem into the boiler, and they steam ʻem up, see. Then, when the fish tray all go in the boiler, they close the door and lock it up. Then open the valve for the steam. And when the steam up so much temperature, then you got to time ʻem up, see. Put down the time, what time the temperature come up so much degree, then look at the time, just put down the times. And after three hours, the fish cook

> already. So you look at the time, then open it, let the guys pull it out fish. (UH 1978:834)
>
> …Cook first and then leave one day, oh, so many hours anyway. Busy time, you cannot leave too long ʻcause the fish keep coming, eh. But most time, we leave one day, and next day it goes to the cannery, workers, see. We have quite many ladies. Mostly ladies' jobs for cleaning. It goes to the tables we get about six tables, you know. When have too many fish, we fill up all the tables. Approximately about 200 women. Maybe more, I think, was. And at the cannery job, I went take over my foreman's job, and I have to take care the machine, where they put ʻem in the can. Put ʻem in the double seamer machine where they cover…We have three machines. Double seamer, they call it. They cover the machine, and seal ʻem up, eh. And then goes to the steam cooker. They going boil again, see... have to sterilize that. Have to cook that. That takes about an hour. Then goes to the—well, those are all machines, see. Then goes to the cooker, and come out about one hour later. Can roll down, and girls pick it up, put ʻem in a box. That goes to the warehouse, see. And of course, somebody stay in the warehouse. They'd stack ʻem up, put ʻem in a truck. (UH 1978:833-834)

Mr. Masuda explained in more detail the role of the Japanese women in Kakaʻako to clean and pack the tuna:

> …about 50, close to 40 [women] on a one table. The cleaning part. And then on the packing table, get about 42, 43. They all pack, see. They all pack with the hands...The head and the bones, and all the skins, and you now, the dirty part of the fish are going to the fertilizer. It goes to the bone meal. They making fertilizer out of that. Only the good part, clean part, they put ʻem in the cannery, in the can, see. But those days, all by hands. Pack with hands, see. (UH 1978:836)
>
> When the cleaning done, they break the whole fish into four pieces eh. Four pieces. That breaks easy. They call that fillet, they call that fillet. So they put ʻem on the hand, and they clean ʻem. Then after clean, put ʻem on a tray on top, and the tray is full, the lady put ʻem in the cutting machines. They go by the conveyor, then goes to the cutting machine. And ladies run the cutting machine. Then goes to the packing table. And the ladies, when the fish come, put ʻem on the table, and then pick it up, put ʻem in a can and throw ʻem to the conveyor where the, you know, the can goes to the machine. Of course, they put the oil, salad oil. They put little salad oil and little salt to make the taste, see. That's all there is. (UH 1978:837)

Mr. Masuda recalled that the *aku* fishermen caught the most fish ever during a few weeks in 1937, which meant continuous work at him and the other workers at Hawaiian Tuna Packers:

> They bring in the fish, average about 85 to 90 tons. Ninety tons now! 85 to 90 tons everyday…And I work six weeks without Sunday off. I works 7, to 10, 11, 12 o'clock in the night. And next day got to come start again. That much fish because we didn't have any machinery. No have no equipment. All by hand, see. So most of the fish, maybe about—we was throwing away lot of fishes those

> days. Cannot handle. So one time we had to stop the fishermen to go out catch. (UH 1978:839)

Mr. Masuda remembered about 18 or 19 *aku* boats berthed at Kewalo Basin, each with about nine or ten crew members. They would catch bait at night and fish during the day. The boats were dry docked two times a year maintenance, cleaning, and painting. Four classes of vessels operated out of Kewalo Basin; *kobune* (Japanese, boat), small one-man boats; 35-40 foot boats designed for catching red snapper; a slightly larger vessel for catching *ahi*; and the specialized *aku* boat.

Section 6 Archaeological Research

The main purpose of this section is to provide a detailed discussion of the archaeological sites within and immediately adjacent to the Project area. Overall, the Kakaʻako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation. Much of the cultural and natural deposits and land forms of the area (lowland marches, sand deposits, coral reef flats, and fishponds) have survived below this fill, and numerous pre-Contact and post-Contact burials have been documented. The fill has thus served as an agency of preservation rather than destruction of early Hawaiian life and the remains on nineteenth century Honolulu and Waikīkī (Griffin et al. 1987:73). Within the current Project area, the waters of Kewalo Basin Harbor were dredged from coral reef and the land sections filled in during the early twentieth century. As such, there are no known cultural properties or *ilina* within the Project area; however, two burials were discovered near the *mauka* side of the Kewalo Basin Harbor at the intersection of Ala Moana Boulevard and Kamakeʻe Street (Souza et al. 2002).

6.1 Early Archaeological Surveys

Most traditional Hawaiian surface structures had been demolished by the time of the first scientific archaeological surveys. In his report on the survey of Oʻahu sites conducted in the early 1930s, McAllister (1933:80) says of Honolulu that information regarding former sites must come completely from literary sources. He does not list Puʻukea Heiau in the Kakaʻako area, but he does note that Peter Corney, a visitor to the island in 1819, saw several *heiau* along the Honolulu shore.

6.2 Kakaʻako Stratigraphy

A large number of archaeological subsurface testing projects and monitoring projects for new building, road, and sewer constructions have been conducted in the Kakaʻako area in the last thirty years. During those projects, archaeologists recorded isolated, intermittent pre-Contact habitation deposits and features (e.g., fire pits, food middens, etc.), marsh and fishpond deposits, small-to-large historic trash dumps, and both pre-Contact and post-Contact burials. The research has also led to a greater understanding of the overall stratigraphy of this coastal section. The Kakaʻako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation. However, much of the cultural and natural deposits and land forms of the area (lowland marshes, Jaucas sand deposits, coral reef flats, and fishponds) survived below this fill. There are three major stratigraphic zones of interest in the Kakaʻako area.

Zone 1 consists of two types of historic fill in Kakaʻako. The first type of fill consists of the layers of material used to bring the various roads in the Kakaʻako area up to grade. The road fill layers in Kakaʻako were made up primarily of crushed coral, soil, and crushed basalt gravel. Government agencies used these materials to bring the sub-standard roads up to grade and to make them passable during the wetter part of the year. The second type of fill was deposited during the various land reclamation projects in Kakaʻako, when fishponds and other low-lying areas were filled. Using dredge material from Honolulu Harbor and the reef flats fronting the Kakaʻako area, large amount of trash and refuse from the town dump, and soil and sand from various locations on the island, Kakaʻako was largely filled in and built over the course of approximately 40 years from ca. 1875 to 1915.

Zone 2 consists of the natural and cultural strata of the land prior to the historic filling of the area, including fishpond deposits, traditional pre-Contact and early historic Hawaiian cultural layers, human burials, and the buried horizon of the pre-fill land surface. Most archaeological features encountered include historic refuse pits, building foundations, scattered historic and pre-Contact artifacts, pre-Contact refuse pits and cultural deposits, fishponds, and both historic and pre-Contact burials. Fishpond deposits are often distinguished as layers of marine sediments containing marine shell and decaying organic matter. Based on the archaeological research completed in Kakaʻako to date, it has become apparent that the vast majority of pre-Contact Hawaiian burials in Kakaʻako are buried in natural sand layers associated with the pre-Contact intertidal shoreline. These sand layers have been extensively disturbed in some areas, but many undisturbed sections remains.

Zone 3 is the geologic non-cultural and pre-cultural stratigraphy of the Kakaʻako area, including sterile coralline Jaucas sand deposits, cinder deposits from the Tantalus/Sugarloaf eruptions, and a coral reef shelf/deposit from the last interglacial period. The Tantalus eruptions are thought to have taken place only six to ten thousand years ago, making them by far the most recent eruptions of Oʻahu. The Tantalus eruptions are relatively unique to Oʻahu in terms of the type of well-sorted cinder produced. The eruption of the cinder predates human occupation in Hawaiʻi by thousands of years. The cinder layer provides a very clear demarcation between the underlying sterile geologic stratigraphy and the layers contemporaneous with cultural activity. This cinder is found only on the inland portion of the Kakaʻako District; on the coastal section the lowest strata is of sterile Jaucas sand. Below both is a coral shelf deposited during the last interglacial period, the Waimanalo Stand, at 122,000 +/- 7,000 years before present (Ferrall 1976).

6.3 Cemeteries and Burials

The Kewalo Basin harbor was formerly a shallow reef that enclosed a deep section of water and the surrounding area was filled during the middle of the twentieth century. There is no documented evidence from archaeological surveys, historical records or oral traditions of post-Contact burials within the Project area. However, the *mauka* sections of the Kakaʻako district contain two large historic cemeteries, the Kawaiahaʻo Cemetery and the Honuakaha Cemetery, and numerous historic burials. The following description places the Project area adjacent to several of these skeletal remains and highlights the view of Kakaʻako as a place of isolation and quarantine on the far eastern border of the city of Honolulu.

The Kawaiahaʻo Church was built in 1842 and then re-built in 1921. The present church is adjacent to two cemeteries, a small one for the missionaries and their families, and a larger one for the church members. In 1993, during a project to widen Queen Street, 116 burial sets were disinterred (Pfeffer et al. 1993), which were all once part of Kawaiahaʻo Cemetery. During testing in 2006 (Tulchin and Hammatt 2006), 13 burial pits were noted, but the burials were not disinterred.

The Honuakaha Cemetery is in the area between Quinn Street and Queen Street. It is estimated that as many as 1,000 smallpox victims were buried in this cemetery during 1854 and 1854. The cemetery does not seem to have been used after that date. A total of 87 burials have been recorded, and 62 of these have been disinterred during four archaeological projects (Avery and Kennedy 1993a, 1993b; Hammatt and Pfeffer 1993; Pfeffer et al. 1993; Winieski et al. 1996). The full extent of the cemetery grounds is still not entirely known, as it may extend under extant buildings, such as the old Kakaʻako Fire Station and the old Honolulu Brewing and Malting Company building.

In addition to the large cemeteries, small clusters of pre- and post-Contact burials and isolated burials have also been found in the Kakaʻako district *mauka* of the former coastline (Anderson 1995a, 1995b, 1997 Bell et al. 2006; Clark 1987; Douglas 1991a, 1991b; Griffin et al. 1987; Hammatt 2007; Hazlett et al. 2007; Kapeliela 1996; Mann and Hammatt 2002; O'Hare et al. 2004; Ota and Kam 1982; Perzinski et al. 2005; Perzinski et al. 2006; Pfeffer et al. 1993; Tulchin and Hammatt 2005; Winieski and Hammatt 2000a; Winieski and Hammatt 2000b; Yent 1985). Significantly, three burials were recently encountered near the Project area during construction (Souza et al. 2002): Burial 1 (SIHP #50–80–14–6376), a single cranium, was inadvertently discovered in dirt removed from Ala Moana Boulevard and Kamakeʻe Street; Burial 2 (SIHP #50–80–14–6377), an adult individual, was inadvertently discovered during backhoe excavations for a box drain on Kamakeʻe Street; and Burial 3 (SIHP #50–80–14–6378), consisting of a femur and several rib fragments, was recovered, but its original location could not be determined.

6.4 CSH Field Inspection

CSH conducted a field inspection of the Project area in April 2010 (Hammatt and Shideler 2010). This archaeological study included small sections of land surrounding the harbor that are not included in the current Project area for the CIA. The inspection confirms that the land margins of Kewalo Basin were almost entirely created from land fill actions of the twentieth century, and that this area remained awash at high tide until the mid-twentieth century. This suggests that no pre-twentieth century in-situ deposits would be expected in the harbor. The original foot path at the edge of the former coastline (see narrow strip of sand in Figure 23) has been transformed through time to a horse path, buggy and cart path, and finally to the widened Ala Moana Boulevard. As a result, early twentieth century human burials and other cultural resources could potentially be located in the extreme inland portion of the Project area adjacent to the *makai* curb of Ala Moana Boulevard, but any lands seaward of the old trail were too close to the water table and too unstable to have been used for permanent habitation or burials.

Section 7 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the Project area. This effort was made by letter, email, telephone and in person contact. The initial outreach effort was started in February 2010. Community consultation was completed in April 2010. In the majority of cases, a letter (Appendix D), map, and an aerial photograph of the Project area were mailed.

In most cases, two to three attempts were made to contact individuals, organizations, and agencies apposite to the CIA for the Project. The results of the community consultation process are presented in Table 2. Written statements from organizations and agencies are presented in Sections 7.1-7.3 below and summaries of interviews with individuals are presented in Section 8.

Table 2. Results of Community Consultation

Name	**Affiliation, Background**	**Comments**
Agard, Louis	Former fisherman at Kewalo Basin	February 11, 2010 CSH sent letter. March 15, 2010 CSH called and left message.
Ailā, William	Hui Mālama I Nā Kūpuna ʻO Hawaiʻi Nei	February 11, 2010 CSH sent letter. March 22, 2010 CSH sent second letter by email.
Alves, Henry	*Kamaʻāina* of Kakaʻako	February 11, 2010 CSH sent letter. March 22, 2010 CSH sent second letter by email.
Apaka, Jeff	Waikiki Community Center *kūpuna*	February 11, 2010 CSH sent letter.
Apo, Peter	MVE Architects for Kakaʻako Makai Master Plan	February 11, 2010 CSH sent letter. March 22, 2010 CSH sent second letter by email. March 26, 2010 Mr. Apo commented by email that the harbor and shore of the Project area has a dark history, as slaves were drowned execution style.
Bacon, Pat Namaka	Bishop Museum Archives	March 25, 2010 CSH called and left message. April 1, 2010 CSH called and left message. April 8, 2010 CSH called and left message.

Name	**Affiliation, Background**	**Comments**
Brown, Desoto	Bishop Museum Archives	March 25, 2010 CSH sent letter by email.
Cayan, Coochie	SHPD	February 11, 2010 CSH sent letter. March 3, 2010 Mrs. Cayan sent a written response (see Section 7.1). Mrs. Cayan recommends interviewing the immediate ocean users, including regular swimmers, surfers, fishermen, stand up boarders, kayakers, canoe clubs and park users, as well as the UH-Mānoa Oral History Library for Kaka‘ako ‘ohana archived interviews, *kūpuna* at the Waikīkī Community Center, Desoto Brown, and George Downing.
Cazimero, Kanoe	Kawaiaha‘o Church Archives & Cemeteries Na Iwi Committee	February 11, 2010 CSH sent letter. March 10, 2010 Mr. Cazimero referred Lopaka Kapanui, Pat Bacon, Kaupena Wong, and the Hawaiian Civic Club of Honolulu.
Confidential	*Kama‘āina* of Kaka‘ako	April 14, 2010 CSH conducted interview (see Section 8.7). April 14, 2010 The confidential participant approved the interview summary.
Downing, George	Save our Surf	March 25, 2010 CSH sent letter by email.
Faulkner, Kiersten	Historic Hawai‘i Foundation	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.
Frierson, Jim	Kaka‘ako Coalition	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.

Name	Affiliation, Background	Comments
Furushima, Scottie	Kewalo Keiki Fishing Conservancy	April 1, 2010 CSH called and left message. April 5, 2010 CSH called and left message. April 13, 2010 CSH called. Mr. Furushima's uncles worked on the *aku sampan* boats and he recalls 30-40 vessels moored at Kewalo Basin during the 1950s. While he laments the loss of the fishing industry and lifestyle surrounding the *aku sampan* and notes that knowledge of specific fish, such as the *akule*, is nearly gone, Mr. Furushima highlights the importance of trying to preserve the remaining *aku sampan*. Mr. Furushima does not have any concerns about the Project.
Hedlund, Nancy	Kakaʻako-Ala Moana Neighborhood Board	February 11, 2010 CSH sent letter. March 25, 2010 CSH second letter sent by email.
Higgins, Collette	Historian specializing in Queen Kapiʻolani, Kapiʻolani Girls' Home and the Kakaʻako Branch Hospital	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email. March 25, 2010 Mrs. Higgins responded that she does not know of the area.
Hughes, Claire	Mother grew up in Kakaʻako	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email. April 5, 2010 CSH called and left message.
Huihui, Micky	Hālau Kū Māna	April 6, 2010 CSH sent letter by email. April 7, 2010 CSH called and left message. April 13, 2010 CSH called and left message.
Iwami, Ron	Friends of Kewalos	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email. March 31, 2010 CSH conducted interview (see Section 8.4). Mr. Iwami referred Scottie Furushima. April 10, 2010 Mr. Iwami approved interview summary.

Name	Affiliation, Background	Comments
Kahn, Leimomi	*Kamaʻāina* of Kakaʻako	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.
Ka Hui O Malama Kakaʻako Paka	(organization)	No contact information available.
Kai Makana	(organization)	March 23, 2010 CSH sent letter.
Kapanui, Lopaka	Mysteries of Honolulu	March 25, 2010 CSH sent letter by email. April 7, 2010 CSH conducted interview (see Section 8.2). April 12, 2010 Mr. Kapanui approved interview summary.
Kapua, Charles	Member of Pearl Harbor Hawaiian Civic Club. Mr. Kapua's grandfather owned a fish market in Kakaʻako	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.
Kekina, Mabel	*Kamaʻāina* of ʻAiea. Mrs. Kekina's father was foreman of Hawaiian Tuna Packers.	February 5, 2010 CSH conducted interview (see Section 8.3). April 1, 2010 Mrs. Kekina approved interview summary.
Kewalo Park Association	(organization)	No contact information available.
Kruse, T. Kehaulani	OIBC	February 11, 2010 CSH sent letter.
Lavoie, Frank	Downtown Neighborhood Board	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.
McKeague, Mark Kawika	OIBC	March 25, 2010 Mr. McQuivey forwarded letter by email to Mr. McKeague. March 29, 2010 Mr. McKeague forwarded message to two Kona representatives, Hinaleimoana Falemei and Kehau Kruse.

Name	Affiliation, Background	Comments
McQuivey, Jace L.	OIBC	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email. March 25, 2010 forwarded message to Mark McKeague.
Mendoca, Melvin	Former McCully firefighter	February 11, 2010 CSH sent letter.
Mitchell, Samuel	Makiki Neighborhood Board	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.
Moses, Ferman	*Aku* fishermen at Kewalo Basin	March 2, 2010 CSH conducted interview (see Section 8.5) May 25, 2010 Mr. Moses approved interview summary.
Nāmuʻo, Clyde	Administrator, OHA	February 11, 2010 CSH sent letter. March 4, 2010 Mr. Nāmuʻo sent a written response (see Section 7.2). Mr. Nāmuʻo referred the Kewalo Park Association, Ka Hui O Malama Kakaʻako Paka, Save Our Kakaʻako Coalition, and Kai Makana
Nihoa, Solomon	*Aku* fishermen at Kewalo Basin	March 2, 2010 CSH conducted interview (see Section 8.6). May 25, 2010 Mr. Nihoa approved interview summary.
Recca, Regina	Ke Alaula o ka Malamalama	February 11, 2010 CSH sent letter.
Save Our Kakaʻako Coalition	Affiliated with Friends of Kewalos	See Ron Iwami.
Steelquist, John A.	Makiki Neighborhood Board	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email.
Stevens, Anne	Ala Moana/Kakaʻako Neighborhood Board	February 11, 2010 CSH sent letter. March 25, 2010 CSH sent second letter by email. April 19, 2010 Ms. Stevens sent a written response by email (see Section 7.3)

Name	Affiliation, Background	Comments
Sylva, Nancy	Hui Ohana o Maunalaha	February 11, 2010 CSH sent letter.
Wong, Kaupena	*Kamaʻāina* of Kakaʻako	No contact information available.
Young, Tin Hu	Kawaiahaʻo Church	January 10, 2010 Mr. Young suggested that one of the main cultural activities in the area is surfing.

7.1 State Historic Preservation Division

CSH contacted Phyllis "Coochie" Cayan, History and Culture Branch Chief of SHPD, on February 26, 2010. In a written response sent to CSH on February 26, 2010 (see Appendix E), Ms. Cayan states that SHPD recommends contacting the immediate ocean users, including swimmers, surfers, fishermen, stand up boarders, kayakers, canoe clubs, and park users. Specifically, Ms. Cayan suggests contacting Desoto Brown of the Bishop Museum, George Downing, and *kūpuna* at the Waikiki Community Center. In addition, she recommended referencing interviews from the UHM Oral History Library for Kakaako. Mrs. Cayan notes that most of the work will be in disturbed areas and that ground disturbance activities in *makai* sandy deposits often reveals burials or related cultural resources. Ms. Cayan further recommends that public access to the park, shoreline, and ocean should not be blocked and that alternatives for access, including adequate parking stalls, are available.

7.2 Office of Hawaiian Affairs

CHS contacted Clyde Nāmuʻo, Administrator of OHA, on February 11, 2010. In a written response sent to CSH on March 4, 2010 (see Appendix F), Mr. Nāmuʻo states that OHA is concerned with maintaining and controlling the marine debris, pollutants, and any foreign matter that may endanger or cause harm to marine resources, water quality, and the fragile Hawaiian ecosystems. Mr. Nāmuʻo explained that in traditional Hawaiian thinking, cultural and natural resources are not distinguished. There is an interconnectivity among all resources from the skies and highest mountain peaks, through the valleys and lava plains, to the shoreline and into the depths of the ocean. Hawaiian genealogical chants link Hawaiians to primary gods and deified chiefs, as well as the stars and the plants and animals. The first and second chants of the sacred Kumulipo detail that in the darkness at the beginning of time the coral polyp, sea cucumbers, shellfish, and seaweed were born, followed by larger marine life. Thus, it is important to acknowledge that the reefs and marine life found within the near- and off-shore waters are not merely resources, but are the foundation for life to Hawaiians. In other words, the ocean is an extension of the Hawaiian people. Mr. Nāmuʻo lists several potentially concerned organizations, including the Kewalo Park Association, Ka Hui O Malama Kakaʻako Paka, Save Our Kakaʻako Coalition, and Kai Makana. In addition, the park and ocean have many recreational users, including canoe paddling clubs, fishermen, swimmers, and surfers.

7.3 Ala Moana/Kakaʻako Neighborhood Board

CSH contacted Anne Stevens, Chair of the Ala Moana/Kakaʻako Neighborhood Board, on February 11, 2010. In a written response sent to CSH on April 17, 2010, Ms. Stevens states that the neighborhood board is supportive of the improvements to the mooring facilities of the Kewalo Basin Harbor, but also articulates five key concerns. First, the traditional fishing and more recent tourist parasail, party boat, and sport fishing businesses should be maintained. While the historic *aku* boats are on the decline, they should be given a special recognition for the contributions they have made to fishing in Hawaiʻi. Ms. Stevens suggests discounting the *aku* fishermen's mooring fees, offering tours, and preserving the history. Second, Ms. Stevens does not recommend developing Kewalo Basin as a "mega yacht" harbor, as it is too far and too expensive for these type of yachts to come in large numbers to Hawaiʻi. She suggests that only five-ten berths be set aside for transient yacht type vessels of 75-150 feet in length, as they desire shore power, security and privacy. Third, the harbor needs more visibility and parking. Ms. Stevens does not want the view from Ala Moana blocked, and suggests that buses remain off-site and that rental cars have free parking. Fourth, the Kewalo Basin should attract locals and tourists. Ms. Stevens suggests borrowing ideas from the Fishing Village at Pier 35, which was spearheaded by the owners of Pacific Ocean Producers. Ms. Stevens lists six specific ways for the harbor to become more attractive: create historical marker on the Trolley Tour, including the 100 year history of Hawaiian Tuna Packers cannery; promote the 6-pack sport fishing business, while giving clients the option to keep the fish they catch; stop the wedding chapels on the western side of the harbor; maintain the John Dominus restaurant; Beautify the adjacent road with landscaping; reduce the feral cat population; and relocate the homeless. Fifth, preserve the valuable resource of the Scotty Furushima's Kewalo Keiki Fishing Conservancy at the cove.

Section 8 Interviews

Kamaʻāina and *kūpuna* with knowledge of the proposed Project and study area participated in semi-structured interviews for this CIA. CSH conducted interviews from February 2010 to April 2010. CSH attempted to contact 39 individuals for this final CIA report; of those, 16 responded and six participated in formal interviews. CSH initiated the interviews with questions from the following six broad categories: *wahi pana* and *moʻolelo,* agriculture and gathering practices, freshwater and marine resources, trails, cultural and historic properties, and burials. Participants' biographical backgrounds, comments, and concerns about the proposed development and Project area and environs are presented below.

8.1 Acknowledgements

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *manaʻo* (thoughts, opinions) with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

8.2 Lopaka Kapanui

CSH interviewed Lopaka Kapanui at the Kakaʻako Waterfront Park on April 7, 2010. Mr. Kapanui, who was raised in Kalihi and Waiʻanae, learned numerous *moʻolelo* of Honolulu, Waikīkī, and throughout Oʻahu from his mentor, renowned Hawaiian history and folklore storyteller, Glen Grant. After Mr. Grant passed away in 2003, Mr. Kapanui has carried on his legacy of ghost tours of Honolulu through the company Mysteries of Honolulu. Mr. Kapanui, who has written two books covering ghost stories in Hawaiʻi, gathers historical information from archives, collects personal accounts through interviews, and recollects stories passed on by Mr. Grant. From this research and experience, he shares with the community narratives that incorporate the historic background and origins of the stories, paranormal accounts, and cultural belief systems in Hawaiʻi.

According to Mr. Kapanui, Hawaiians traditionally dedicated newly constructed *heiau* to the war god Kū and other primary male gods and christened special events with human sacrifices. For example, when Kamehameha dedicated Puʻukoholoa Heiau to Kū in order to ensure the unification of the Hawaiian Islands, he invited his cousin and chief rival, Keoua, to the dedication. Keoua was killed by a spear on a canoe before entering Kawaihae Bay. Yet Keoua, in his foresight, had previously circumcised himself on the canoe so that his body would not be intact for his fated sacrifice, and this lessened the impact his sacrifice would have on Kū and the ambitions of Kamehameha. High ranking *aliʻi* such as Keoua made exceptional sacrificial victims, but usually sacrifices came from the *kauwā*. Members of this lowest caste would flee at the sound of blowing conch shells and beating drums, which signaled the need to capture a sacrificial victim.

Mr. Kapanui remembers that his mother, who worked in the Kalihi Poi Factory, described the Kakaʻako area as a place of coral flats, landfill, and dumps. He relates a story of sacrificial drowning that once took place in this area. Kānelāʻau Heiau, a sacrificial *heiau*, was once located on the slopes of Punchbowl Crater and another near the former coastline at the Kawaiahaʻo Church. In these areas, the victims were strangled underwater so that the victim's body would remain intact without excessive blood and bruises. The sacrificial drowning took place at the waters of the Kewalo Basin and an inland pond located at the current Blaisdell Center site.

Other stories describe numerous deaths in historic times. In the 1850s, a smallpox epidemic ravaged Hawaiʻi. Underneath the old Kakaʻako Fire Station, the smallpox victims were buried on top of each other. Older firemen have shared their experiences with Mr. Kapanui of the haunted fire station. Several felt intense weight on their chests as they slept, as if someone was sitting on them. In addition, Mr. Kapanui learned from the late Mr. Grant that the Kawaiahaʻo Church cemetery could not accommodate all the smallpox victims, so over 3,000 people were buried in a mass grave underneath land near the former coast, now a parking lot at Restaurant Row.

Mr. Kapanui is primarily concerned that the Project may impact the sea life.

8.3 Mabel Kekina

CSH met with Mabel Kekina (Figure 36) on February 5, 2010 at her home in ʻAiea Heights. This interview, combined with sections of a previous interview (Genz and Hammatt 2010) reveal Mrs. Kekina's familiarity with the streams, springs, canals, reefs, and ocean waters of Kakaʻako and neighboring areas of Waikīkī, Makīkī, and Mānoa.

Mrs. Kekina, now 81 years old, was born in the *ahupuaʻa* of Pālolo in 1928. Her parents were both Japanese; her father, who worked as a boat builder at the Kewalo Basin Harbor, came to Hawaiʻi as an infant and her mother, who worked in the pineapple cannery, was born in Hawaiʻi. They moved to the community of Mōʻiliʻili in Mānoa when Mrs. Kekina was a small child. There she attended Mother Rice Kindergarten, Prince Jonah Kuhio Elementary School, Washington Intermediate School, and McKinley High School. Around 1955, she moved farther west to Waimalu Ahupuaʻa, but construction of the H-1 Interstate directly above her property forced her to move and since 1969 she has resided near the top of ʻAiea Heights in ʻAiea Ahupuaʻa.

Mrs. Kekina's childhood memories center on her wanderings throughout Makīkī, Mānoa, Waikīkī, and Kakaʻako. As a child, Mrs. Kekina was drawn to explore all the areas that had water: "You know how kids are, right? We explore all the areas that have water." Thus, she recollects with specificity the streams, waterfalls, springs, wells, canals, reefs, and ocean waters throughout these regions in the 1930s and 1940s. These water systems were primarily a means of recreation for Mrs. Kekina. For example, she recalls how she and her childhood friends built and launched canoes in Mānoa Stream:

> My memories of growing up in Mōʻiliʻili was so happy. As a kid, we used to do things that children today will never experience. Now they want to kayak they go to the store and buy it, in those days when only the father in the family worked, we couldn't afford a lot of things. We used to get the corrugated roofing and bend it in the shape of a canoe and put boards across to hold it in shape, and then wait

> for a real hot day and go down to the road and scoop up the soft tar and plug up all the holes. And that is how we made our canoe, by corrugated tin and asphalt.

The streams and canals did not have bridges at this time, but this did not stop Mrs. Kekina. She and her friends regularly walked on trails from Mōʻiliʻili to Waikīkī by wading across the Mānoa Stream, crossing a cow pasture (now the Ala Wai Golf Course), and wading across the Ala Wai Canal. There she would spend time on the reef, dive into the waters of the Natatorium, and swim in the ocean at San Souci.

Mrs. Kekina also played in the flowing waters of an artesian well that was located very close to her residence in Mōʻiliʻili. At the end of the eastern section of Nakoʻokoʻo Street, water flowed from a pump into a trough that went across what is now Kapiʻolani Boulevard to rice fields located at the current intersection of Date Street and Kapiʻolani Boulevard. The artesian well supplied Chinese rice farmers with water for irrigation. In addition to their rice fields, these farmers grew vegetables, such as sweet potatoes (*ʻuala*) and carrots (see Appendix B for common and scientific plant and animal names mentioned by community participants). This cultivation of the land intensified after December 7, 1941, when World War II created a shortage of supplies. Mrs. Kekina paints a dramatic image of the irrigated rice fields during this time period:

> I remember that artesian well with the trough going to the rice fields. We used to catch frogs in the rice fields and sell it to the Chinese farmers—frog legs! It's in the fields we catch and sell it to them. I can remember water buffalo. You don't see that anymore. And then when they harvested their rice, all the kids in the neighborhood would rush to where they had the huge bamboo trays and they would flip the grains in the air to get rid of the husk. I remember this round cement platform and right in the middle was this hole. The water buffalo was tied to that hole, and they would make the buffalo walk around and around, stomp on the grain to get it off the stalk. Those are memories that are priceless to me, something the kids today will never experience.

In addition to recreation and irrigation, the water systems also provided subsistence. Mrs. Kekina caught freshwater shrimp in the streams of Mānoa and she hunted crabs and fished in the Ala Wai Canal and along the reefs near the Natatorium and Ala Moana Park. She also observed how fishermen caught mullet with "wooden horses":

> They had the mullet fishermen who sat on these wooden horses in the water. They would set it up in the water, in the shallow area. It is just wooden, put a platform with a backrest. And they would sit there for hours sitting for mullet. I don't think there is mullet in there today. But I remember in Ala Moana Park there was one lone fishermen who set his wooden horse on the reef, because I swam across the reef and said, "Oh, what are you catching?" And he pointed to his little basket and there were all these mullet swimming all around. I said, "How do you know where to catch those mullet?" He said, "Oh, the day before I come and spread what they call chum and litter it on the reef." The mullets would come to that area, knowing that is where the food is. So the next day he gets this big inner tube

> with a canvas across it, puts all his gear, swims across, and starts fishing. And that's his dinner. You know, all of that era is gone now.

While Mrs. Kekina explored the ocean waters of Waikīkī with her friends, she also learned about Kewalo Basin Harbor in Kakaʻako and waters offshore through her father. He worked as the shipyard foreman for Hawaiian Tuna Packers and built *sampan* boats for *aku* fishing. In the waters of Kewalo Basin at the Kewalo Cove, Mrs. Kekina used bamboo fishing poles to catch *menpachi (ʻūʻū)*, which her mother then cooked in an exceptional recipe of miso soup. Her father regularly received whole tuna from the fishermen. Mrs. Kekina's family regularly ate these tuna, as well as leftover pineapple cores that her mother brought home from working in the pineapple cannery. Mrs. Kekina also experienced the ocean with her father, who regularly delivered the *sampan* boats to Maui and Kauaʻi.

Figure 36. Mabel Kekina (CSH February 5, 2010)

8.4 Ron Iwami

CSH met with Ron Iwami, a retired fireman and avid surfer, on March 31, 2010 at the Kewalo Basin Park, which is located *makai* of the Kewalo Basin Harbor. As the park is managed by the HCDA, Mr. Iwami and friends founded the Kewalo Basin Park Association in 2005 to represent the recreational users of the park and the surrounding ocean, including surfers, fishermen, divers, swimmers, and joggers. The organization recently attained status as a Non-Profit Organization (501C3) under the name Friends of Kewalos.

Born in 1955, Mr. Iwami, now 54 years old, has been surfing at “Kewalos”—the Kewalo Basin—for most of his life and has witnessed intense changes to the harbor, the land, and the surrounding ocean. While attending Roosevelt High School, Mr. Iwami and his friends discovered several hidden surf breaks near the harbor entrance. Mr. Iwami recalls that the triangular section of land *makai* of the harbor used to be covered with dense *haole koa* (invasive tree species). By following a small trail, the 15-year old and his friends walked to the secret surf spots because they were hidden from view. In addition to the thick *haole koa* blocking the view of the ocean, the eastern portion of land *makai* of the harbor used to be a storage facility for tour buses and helicopter landing pad, and the portion of land on the other side of the harbor channel, now the Kaka‘ako Waterfront Park, used to be a City and County landfill.

What has developed from Mr. Iwami’s childhood discovery around 1970 is an intense social community of surfers. Mr. Iwami has now been surfing at Kewalos for over 40 years, and many of his childhood friends still surf every morning before work as part of the “Dawn Patrol.” Mr. Iwami explains that surfing, with the twin elements of physical exercise and emotional enjoyment, initially brought him and his friends to Kewalo Basin and continues to draw them to the area today. Several social groups incorporating Mr. Iwami’s generation and a younger generation have formed according to the four distinct surf breaks. On the eastern end of the shoreline is Marine Land, named after a dolphin laboratory that used to be located on shore. Straight Outs, so called because it is straight out from the showers, is centrally located. Farther to the west is a break alternately called Rennicks, named after a past surfer, and Right Next, since it is located adjacent to the premiere surf break next to the channel, The Point. In addition, Point Panic is a body surfing break located west of the harbor channel in front of the Kaka‘ako Waterfront Park. The daily routine of the surfers of the Dawn Patrol is to talk-story before surfing, surf as the sun rises, and finally shower and leave for work. Mr. Iwami knows a lot of the regular surfers and many other recreational users of the small park since the seawall, which is used to enter and exit the water, is short and can be seen in its entirety from either end. Overall, the oceanic environment (the close proximity of excellent surf breaks), the geography of the land (the short section of oceanfront land), and the infrastructure (the single entrance to the park) have contributed to the enduring bonds of a social community of surfers.

Mr. Iwami recalls from his childhood that many *aku sampan* boats used to line the *makai* portion of the harbor. He remembers how the fisherman used to lay out their fishing nets on the eastern portion of the harbor for maintenance, and that a building was erected on the western portion of the park to facilitate their repair work. Mr. Iwami laments that now only the *Kula Kai* and a few other *aku sampan* boats remain, and that the building is no longer used to dry and repair the *aku* bait fishing nets. He notes, however, that the building is currently leased by a

Hawaiian charter school, Hālau Kū Māna, which has taken responsibility of a section of the land by planting a garden with native Hawaiian plants.

Just as the statue of the *pueo* (Figure 37) at Kewalo Basin Park stands as an *ʻaumakua* of the area, Mr. Iwami and the Friends of Kewalos aim to protect the land and ocean. Mr. Iwami has several concerns regarding the improvements of the harbor, which he has also summarized in a written statement from the non-profit organization, Friends of Kewalos (Appendix G).

First, toxic and hazardous substances that are generated during the construction phase could flow out to the nearby fishing and surfing areas, including the surf spots on the Diamond Head side and the ʻEwa side of the harbor channel. Such contamination is a danger to the public and sea life. To emphasize his concern, Mr. Iwami shares the history of a surf spot once known as "Garbage Hole." This used to be the premiere surfing location on the southern shore of Oʻahu, but the construction of Magic Island altered the underwater topography so much that the surf break has disappeared altogether. Second, increasing the number of slips from 143 to 250 will drastically increase the amount of boats going in and out of the channel. This may form a chop that ruins the waves and increases the chance of accidents. Third, the addition of slips means that more boats can possibly leak hazardous materials into the ocean. Fourth, public access to the Kewalo Basin Park must be ensured during and after the construction phase with no decrease in free parking availability. Fifth, Friends of Kewalos does not want to see any changes to the harbor channel, such as dredging to widen the channel, as this will directly and drastically impact the recreational usage of the area.

Figure 37. Statue of the *pueo ʻaumakua* of Kakaʻako at the entrance to the Kewalo Basin Harbor (CSH March 31, 2010)

8.5 Ferman Moses

CSH met with Uncle Ferman Moses, chief engineer, and Solomon Nihoa, pilot (Figure 38), of the *Kula Kai* (Figure 39) at the Kewalo Basin Harbor onboard their vessel on March 2, 2010. Mr. Moses shares several stories and relates his experiences of *aku* fishing that span over four decades. Mr. Moses's recollections reveal a deep history of *aku* fishing in Hawaiʻi, describe the unique specificity of the Japanese-built *sampan aku* boats and the techniques of *aku* fishing, and highlight the cultural significance of the *Kula Kai* as the last of the original wooden *sampan aku* boats in Hawaiʻi.

Mr. Moses was born on June 7, 1941 on Mokil Atoll in Pohnpei State in the Federated States of Micronesia. As a native of Mokil, Mr. Moses fished in his youth for subsistence. As a young adult, Mr. Moses spent two years learning how to fish for *aku* and operate *aku* boats in Palau. This training enabled him to search for work overseas, and, after arriving in Hawaiʻi in 1967, he secured a job on the *sampan aku* boats with the Hawaiian Tuna Packers, Ltd. cannery at Kewalo Basin Harbor. Although the tuna cannery went out of business about 20 years ago, Mr. Moses has continued to work on the declining number of *sampan aku* boats at Kewalo Basin Harbor.

For the novice fisherman, Mr. Moses explains the unique specificity of the *sampan aku* boats and the techniques of *aku* fishing. An *aku* boat is a large *sampan* specifically designed to catch *aku*. First, the fishermen spot and catch the bait. Several divers first enter the water from a small skiff to enclose *nehu* with nets (Figure 40). This takes place in several bays and harbors, including Honolulu Harbor, Keʻehi Lagoon, Kāneʻohe Bay, and, until the events of 9/11 restricted access, Pearl Harbor. Once transferred to the main vessel (Figure 41), these live anchovies serve as bait to attract schools of *aku*. On a separate day, the pilot determines where to search for schools of *aku* by either following the long-line trollers, drawing upon his past experience, or heading toward Fish Aggregating Devices (FADs). A sure sign of the presence of *aku* is sighting frigate birds, which eat the anchovies, which, in turn, are consumed by the *aku*. After locating a school of feeding *aku*, the fishermen add their own bait to the water. Now, the uniqueness of the design of the *sampan aku* boats becomes apparent. The stern of the vessel has a reduced gunwale. Approximately six fishermen stand in a line at the back of the boat spaced about a foot apart from each other armed with fishing poles. When the *aku* surface to bite the *nehu*, the fishermen catch them with barbless baited hooks (Figure 42) on long bamboo or fiberglass poles (Figure 43) and easily pull them into the vessel without the need to haul them over the heightened gunwales on the sides of the ship. In a single day with excellent sea and weather conditions, the crew of the *Kula Kai* can catch, on average, 10,000-15,000 pounds of *aku*. The largest *aku* Mr. Moses ever caught was 40 pounds, a size which younger fishermen, such as Mr. Nihoa, have never seen. In fact, on this particular fishing day, each *aku* in the entire school weighed 40 pounds. Mr. Moses remembers returning to shore quickly that day with 10,000 pounds of *aku*. Mr. Nihoa, in a separate interview summary, describes in more detail the process of locating and catching the *nehu* and *aku*.

Mr. Moses recalls that in 1967 about 20 *sampan aku* boats were moored at the Kewalo Basin Harbor. He first worked as an *aku* fisherman on the *Marlin*, of which he has particularly vivid memories. During an early morning trip from Oʻahu to Molokaʻi, the *Marlin* encountered high seas and began to take on water. As the *sampan's* engineer, Mr. Moses was down in the engine room when trouble began. As water began to fill the boat, Mr. Moses realized that the hatch overhead had jammed. He then resigned himself to a death at sea. Miraculously, Mr. Moses saw a bright light as the hatch cover opened under water. The crew fastened themselves to a life raft and a skiff, but the life raft soon deflated and the skiff's sides had already torn away. The two groups began to drift apart on these dilapidated crafts. The waves were so high and the wind so fierce that most of the crew's clothes were torn off. Four hours later, personnel of a passing trolling boat saw the crew's flare and followed a trail of debris to rescue the barely floating and nearly naked survivors.

After the *Marlin* sank, Mr. Moses worked on the *Neptune*. This *aku* boat later sank in its own slip at the Kewalo Basin Harbor due to neglect about 10 years ago. The State of Hawaiʻi subsequently scuttled the boat in deep water offshore. Finally, Mr. Moses found employment on the *Kula Kai* as chief engineer.

According to Mr. Moses, the *Kula Kai*, which measures 89 feet in length, is the last of the original wooden *sampan aku* boats. Mr. Moses recalls that a Japanese boat builder constructed the *Kula Kai* in the Honolulu shipyard about 60 years ago. The integrity of the original wooden structure has remained intact despite the recent reinforcement of fiberglass on the hull. As chief engineer, Mr. Moses spends much of his time maintaining the twin Caterpillar 400 turbo diesel engine and generator. The only other surviving *sampan* is the *Nisei*, which is currently docked adjacent to the *Kula Kai*. In contrast to the integrity of the *Kula Kai*, the *Nisei* has been renovated with modern materials and navigation technology.

Mr. Moses describes the scene of the *aku* fishermen in 1967. The crew of the 20 *aku* boats comprised a small, vibrant community. They regularly gathered on the shore of the harbor on the present-day eastern parking lot. There, Mr. Moses and the other *aku* fishermen repaired their nets. They stretched out their nets, which reached lengths of 200-300 yards, in order to mend them. The *aku* fishermen worked at a leisurely pace, which afforded them plenty of time to talk story. Later, when the parking lot was built, the fishermen moved to the eastern entrance of the harbor, an area now used by a Hawaiian charter school, Hālau Kū Māna.

Mr. Moses is concerned that the Project may impact the maneuverability of the *Kula Kai*. This *sampan aku* boat is powered by a single prop, which creates a very slow turning radius for the length of the hull. To leave the harbor, the *Kula Kai*, which is docked near the entrance to the harbor, must slowly and carefully reverse out of its slip so as to not hit the nearby vessels docked on the opposite slip. The distance to the next slip is barely longer that the 89 feet of the *Kula Kai* itself, so Mr. Nihoa, the pilot, must repeatedly reverse and move forward in small turning increments to safely pilot the *Kula Kai* out of its slip. Based on this established pattern of leaving the slip, Mr. Moses is concerned that the addition of slips and accompanying vessels will further diminish the maneuverability of the *Kula Kai* at the harbor, which, in turn, could affect its capacity to leave the harbor and make a profit at *aku* fishing.

Figure 38. Ferman Moses and Solomon Nihoa, Jr. (CSH March 2, 2010)

Figure 39. *Kula Kai* adjacent to *Nisei* (CSH March 2, 2010)

Figure 40. Nets to catch *nehu* (CSH March 2, 2010)

Figure 41. *Nehu* in storage well (CSH March 2, 2010)

Figure 42. Barbless hook (CSH March 2, 2010)

Figure 43. Fiberglass pole, traditionally made from bamboo, with belt (CSH March 2, 2010)

8.6 Solomon Nihoa

CSH met with Solomon Nihoa, pilot, and Uncle Ferman Moses, chief engineer, of the *Kula Kai* at the Kewalo Basin Harbor onboard their vessel on March 2, 2010. Mr. Nihoa is the pilot of the *Kula Kai* and has been working as a fisherman at Kewalo Basin for 20 years. Mr. Nihoa, one of ten children of Solomon and Winona Nihoa, was raised on the windward side of Oʻahu in Kāneʻohe and Waimānalo. He explained how he got started as an *aku* fisherman at Kewalo 20 years ago in 1990:

> My oldest brother, Lono, who has since passed away, had already been working on the *aku* boat called the *Corsair* for around eight years. Once I was old enough, he got me a job on the *Corsair* as a fisherman. He was basically my boss, showing me the ropes and teaching me the ins and outs of being a fisherman on an *aku* boat. Like most jobs, being a new crew member meant we had to start at the bottom and learn everything from the bottom up.

Mr. Nihoa was asked about the different *sampan* he has worked on during his tenure at Kewalo Basin:

> When I first got started, it was the *Corsair*. I worked on that boat for around five years. It sank fifteen years ago while trying to enter Kewalo Basin during high surf. It was eventually towed out to sea and sunk in the deep ocean. The next boat I worked on was the *Neptune*; it was also an old wooden *sampan*. It was deemed too old and was also sunk in the deep ocean. Next boat I worked on was the *Orion*, again, too old and was sunk off shore with the others. The boat I work on now, the *Kula Kai*, is the only remaining wooden *sampan* left. There are only two *aku* boats left in Hawaiʻi, the *Kula Kai* and the *Nissei*. The *Nissei* is made of steel and fiberglass, it is a newer boat and not part of the original *sampan* that used to be here in Kewalo Basin.

Mr. Nihoa explained the process for catching *aku* started with first catching the bait. The bait used for catching *aku* is a variety of anchovy called *nehu*. Mr. Nihoa explained:

> Once we have the minimum number of crew members to go fishing, which is six, and the weather is good, we would leave Kewalo early in the morning, maybe two or three a.m. We would go to known fishing grounds that have *nehu*. Before 9/11, we used to catch *nehu* in Pearl Harbor all the time. We actually caught bait in Pearl Harbor on September 10, 2001. That was the last time we were allowed in Pearl Harbor. Since then, the waters in Pearl Harbor have been off limits to fishing. So now we catch bait in Keʻehi Lagoon.
>
> The way we catch bait is when we get to the fishing grounds, we look for the *nehu* schools. It's still dark out so you really got to look good. When the school of *nehu* swims near the surface of the water, you can see flickers of light below the ocean surface. This can be seen without flash lights, just a trained eye. Once we locate the *nehu*, we'll lower our small boat called the skiff into the water, loaded with our nets and the crew on the skiff would surround the school of *nehu* with the nets. One diver, sometimes two, would dive to the bottom of the net and tie it

> closed. From there, we would drag the nets with the skiff and pull it along side our boat. Once the smaller boat was alongside the bigger boat, we would use five-gallon-buckets and scoop the live *nehu* into the bait wells located on the deck of the bigger boat. Each bait well is around eight feet deep and the sides are eight feet by eight feet. We would load up to six bait wells full of *nehu* and keep them alive with sea water and a pump system to keep the water moving. During night time hours, we would have a light lit in each bait well because without the light, the *nehu* would swim into the sides of the bait well and die. So we need them alive and that's why each well is lit at night.

Mr. Nihoa explained the next step would be to begin the hunt for schools of *aku*:

> Just like catching bait, we got to know fishing grounds for *aku*. So once we have the required amount of bait, we would head out to sea and get the boat in the general area of our fishing grounds. Once there, we would look for these birds having something like a feeding frenzy at the surface of the water. These birds, I believe are French Frigate birds. They also eat *nehu* just like the *aku*. So when we see the frigates feeding on the water, we know that they are eating *nehu*, which may mean that a school of *aku* may be feeding there also. Because we are in the open ocean, it is very difficult to spot these birds. It takes a very trained eye to find the feeding birds, a skill set that very few people have. So we would position the boat alongside the feeding frenzy and we would spray a mist of water on to the surface of the ocean causing some confusion to the *aku* and blurring the water surface.

Mr. Nihoa continued that once the boat was in position with the back of the boat facing the school of *aku* engaged in feeding off the *nehu,* and the *aku* boat's water mist is actively blurring the water surface, the *nehu* from the bait wells would add to the feeding frenzy:

> We would take our nets and begin scooping the *nehu* from our bait wells and toss them into the water where the *aku* is. We would just keep adding the *nehu* into the water causing a major feeding frenzy, a process we call "chumming." Once the frenzy is going on at the back of the boat, we would grab our fishing poles and start fishing for *aku*. Our poles are in three different lengths, ten feet up to 15 feet, 15 feet, and between 15 and 20 feet in length. Each line has a lure and a barbless hook about one inch long. We would position ourselves at the rear of the boat standing right above the feeding frenzy, lower our line into the water and yank the *aku* right out on the boat. If we are this close to the point where the feeding is right at the boat, we would use the shorter poles, the ten-footer. The farther away the feeding is, the longer poles would be used. Once we hook a fish, we would yank them out of the water, over our heads, and onto the deck, and because the hooks are barbless, they disengage from the fish and we drop the line back in the water and snag another fish. We would just continue this until we got pretty much the whole school. We can fill the boat with *aku* in less than 30 minutes, more like 15 minutes. Six of us at the back of the boat fishing, yeah, I'd say 15 minutes. Once we had them onboard, we would put them into the wells on the boat and ice

> them down. If we had enough catch, we would head back to shore or continue looking for another school.

Mr. Nihoa also explained that if the *aku* boat was unable to spot the feeding frigates, the boat would then search for FADs:

> If we are out at sea and can't find the frigates, we would go to one of the FAD buoys and see if any *aku* schools are there. The State placed these FAD buoy around the island's waters to attract *aku*, *ono* (mackerel), *mahimahi* (dolphin fish), and billfish. So sometimes we are successful at using these devices to catch fish.

Once back in Honolulu, the *aku* boat would head to an unloading dock near the fish auction block located at Pier 38. The fish would be loaded onto a scale and then trucked into the fish auction house for immediate sale. *Aku* prices can range from ten cents per pound to up to $3.50 per pound:

> When we get back in port, we usually save some of the *aku* for the crew. Each crew member may get one *aku* to take home or they can choose to sell it at the auction house and keep the cash. On good days, we may get two fishes each, one to take home and one to sell for the cash. The rest of the *aku* would go to the fish auction house and once we unloaded and got the weight calculated and the business side of things done, we would head back to Kewalo Basin.

Mr. Nihoa mentioned another way that *aku* may be used:

> Sometimes when we have a good catch, we would take some of the fish and make dried *aku*. The boat has these dry-boxes that we would use to make the dry *aku*. Once the fish was cleaned and gutted, we would filet them, season them with Hawaiian salt, and then place them in the dry-box while we're still out at sea. The best dry *aku* is made out at sea where there are no pollutants present, just clean sea air. It usually takes two days to make good dry *aku*. We usually make dry *aku* to eat or for family, not for sale. The funny thing is dry *aku* can sell for as much as three times the amount of fresh *aku*, seems like a much higher demand for dry *aku* but making dry *aku* for large quantities is not easy. We would maybe make 20 pounds of dry *aku* on the boat and sell eight to ten thousand pounds of fresh *aku* to the fish auction house.

Like Mr. Moses, Mr. Nihoa is concerned that the Project may impact the maneuverability of the *Kula Kai*. This *sampan aku* boat is powered by a single prop, which creates a very slow turning radius for the length of the hull. To leave the harbor, the *Kula Kai*, which is docked near the entrance to the harbor, must slowly and carefully reverse out of its slip so as to not hit the nearby vessels docked on the opposite slip. The distance to the next slip is barely longer that the 89 feet of the *Kula Kai* itself, so Mr. Nihoa must repeatedly reverse and move forward in small turning increments to safely pilot the *Kula Kai* out of its slip. Based on this established pattern of leaving the slip, Mr. Nihoa is concerned that the addition of slips and accompanying vessels will further diminish the maneuverability of the *Kula Kai* at the harbor, which, in turn, could affect its capacity to leave the harbor and make a profit at *aku* fishing.

8.7 *Kamaʻāina* of Kakaʻako

CSH met with a *kamaʻāina* of Kakaʻako on April 14, 2010. The respondent asked to be a confidential participant in this CIA. The interview, combined with sections of a previous CSH interview in which the respondent participated (Spearing et al. 2008), reveals extensive knowledge of the ocean and wetland resources at and near the Project area and provides a window into the life of the diverse ethnic neighborhoods of Kakaʻako.

The participant was born on Jan 4, 1942 in Honolulu at Kapiʻolani Hospital. His/her family lived in a two story home in Kakaʻako on Waimanu Street at the current Imperial Plaza condominium and moved to Nuʻuanu in 1952 when the industrialization of Kakaʻako began. He/she lived there with his/her mother, grandfather, grandmother, and siblings.

He/she was very influenced by his/her grandmother, who spoke in Hawaiian and shared her knowledge of medicinal and agricultural plants, seafood, and Hawaiian customs, such as the lūʻau (Hawaiian feast). One story related by the participant connects his/her grandmother and mother to a Chinese oracle. When the participant's mother was four years old, the village seer visited the family and reminded them of his prophecy he proclaimed at her birth. A birthmark on her foot foretold that she would travel throughout the world, and he poetically named her Pūpū, a shell that was destined to see all the seashores of the world. When the participant's grandmother contracted cancer nine years later, her husband—the participant's grandfather—sent her to relatives in China, as the village herbalists knew how to treat the disease. This started to fulfill the prophecy, as the participant's mother also made the voyage to China. En route she befriended a Chinese boy whose father was the galley chef, and as a result she and her mother ate well during the voyage. One event formed a lasting impression on the participant's mother—her mother spoke with ease in Hawaiian to another Chinese woman in China. The participant recalls that even during his/her childhood, many people often crouched low in the presence of his/her grandmother out of respect.

He/she recalls that the Kakaʻako neighborhood of his/her childhood housed several distinct ethnic groups, including Japanese, Portuguese, Filipino, and Chinese immigrant families. A Japanese family owned a store nearby, and his/her Japanese neighbors lived in a redwood house complete with their own *furo* (wash room) in the house, which was unusual for the time, as most Japanese families used a public bathhouse. Portuguese families lived on Ward and Kawaiahaʻo Streets and celebrated the Holy Ghost festival with parades, while Filipino families often sat on his/her porch. He/she also remembers a Chinese man who sold *manapua* (Chinese-style steamed buns filled with meat), pork hash, and *pepiao* (Chinese style dumpling) in the neighborhood, and he/she secretly ate their Chinese neighbors' mangoes. He/she reflects that the different ethnic groups mingled with each other even though they lived in discrete neighborhoods.

He/she continues to characterize the colorful neighborhoods of Kakaʻako. The first supermarket on Oʻahu opened on Kapiʻolani Street across from the Blaisdell Center at the current Flamingo Chuckwagon. An old barber shop operated on Queen Street with *tatami* (woven reed) mats. Mother Waldron Park was a hang-out for the older kids. At the Kewalo Theater, he/she saw movies such as Bird of Paradise and Saturday morning cartoons. Overall, Kakaʻako was a safe place to live. The older kids stayed out late at night and walked home, and families did not lock their doors as everyone knew each other.

The neighbors often held *lūʻau*. He/she became aware of an approaching lūʻau when he/she heard a pig screaming in a pigpen. All the neighbors helped. His/her uncles brought fish. His/her grandmother would lomilomi (massage) the fish with *ʻinamona*, a relish made of the cooked kernel of candlenut (*kukui*) and salt, and then add *limu ogo* (*manauea*, a kind of seeweed). His/her grandmother also made *poi* (cooked taro), grew sweet potatoes, and raised chickens. The participants' responsibility at four years of age was to cook rice.

He/she remembers the land *mauka* of the Ala Moana Beach as primarily marshes. The land was very spacious with very few residences. There he/she collected medicinal herbs with his/her grandmother who practiced *laʻau lapaʻau* (medicine). They collected *ʻuhaloa* (American weed) for sore throat. They also gathered castor beans for treating chicken pox and skin problems. They boiled the beans and the ailing person bathed with them. His/her grandmother also grew guava and picked the young shoots for diarrhea. They also collected a small crawling plant similar to aloe but without thorns at sandy areas to mend broken legs. They mashed it, urinated on it, and placed it on the broken leg. For asthma, they mashed *pōpolo* (nightshade) leaves and steamed them in *tī* (no translation) leaves with a little salt. The asthmatic person chewed and swallowed it with a spoonful of *poi*. If he/she were becoming sick he/she received a water enema and drank *māmaki* (no translation) or guava tea. He/she also sat on a chair with a bucket of boiled herbs under them. Covered with a blanket, he/she smelled the boiled herbs, sweated, and finally slept.

He/she also gathered limu (seaweed) with his/her grandmother on the shores of Ala Moana Beach, including *limu ʻeleʻele* (no translation), which was used to enhance stews, *limu ogo*, and a kind of *limu* that grows on *ʻopihi* (limpets). In addition to the knowledge of medicinal plants and limu, his/her grandmother had the best reputed garden in the area. Neighboring women often stopped by her garden before church to gather flowers and plants for their hats. Large baskets of *lauaʻe* (ferns) hung from the rafters above the porch.

He/she shares fond memories of Kewalo Basin. As a child, he/she learned to swim in the harbor, and often ran on the piers without any moored *aku sampan* to avoid being pushed in the water by his/her childhood friends. He/she fished in the harbor and caught several kinds of reef fish, including *ʻāweoweo* (big eye), *manini* (convict tang), *ʻōpelu* (mackeral scad), *āholehole* (juvenile flagtail), *ʻamaʻama* (striped mullet), and squid (octopus). Several of his/her uncles were *aku sampan* fishermen at Kewalo Basin. After selling their catch at the fish auction, they divided any extra fish amongst themselves and shared it with their families. They also dried the fish and squid. He/she remembers that while not fishing, his/her uncles and other fishermen repaired their nets, cleaned the boats, and talked story.

Section 9 Cultural Landscape

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the Project area are presented below. This section integrates information from Sections 3-8 in order to examine cultural resources and practices identified within or in proximity to the Project area in the broader context of the encompassing Kakaʻako landscape.

9.1 *Wahi Pana* and *Moʻolelo*

The current urban district known as Kakaʻako is significantly larger than the traditional area of the same name, which is described in mid-nineteenth century documents and maps as a small *ʻili*. In addition to Kakaʻako, the area also includes lands once known as Kaʻākaukukui, Puʻunui, Pualoalo Kewalo, Kōʻula, and Kukuluāeʻo. The Kakaʻako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation; however, the fill has served as an agency of preservation rather than destruction of early Hawaiian life and the remains of nineteenth century Honolulu and Waikīkī (Griffin et al. 1987:73). Much of the *wahi pana*, *loko iʻa*, *heiau*, and other cultural resources, and natural deposits and land forms of the area have survived below this fill, and accompanying *moʻolelo*, *oli*, *ʻōlelo noʻeau*, and *wānana* have been documented that still resonate with Hawaiians of the Kakaʻako district today.

The dark history of Kakaʻako has left a lasting impression on community members such as Mr. Apo and Mr. Kapanui. The coastal waters of Kewalo near the Project area once contained a pond called Kawailumalumai that was used to sacrifice *kauwā*, or members of a pariah caste, designed for the sacrificial *heiau* of Kānelāʻau on the slopes of Pūowaina as the first step in a drowning ritual known as Kānāwai Kaiheheʻe (Kamakau 1991:6) or Ke-kai-heʻeheʻe (Westervelt 1963:16). Mr. Kapanui elaborates that the *kauwā* were strangled underwater, which ensured that the victim's body remained intact without excessive blood and bruises in order to appease the war god Kū and other primary male gods. Mr. Kapanui draws from this *moʻolelo* today to enrapture visitors.

Another *moʻolelo* point to the coastal marches of Kewalo as the habitat of the original *pueo* that became one of the Hawaiians' *ʻaumakua* (Westervelt 1963:135-137; Thrum 1998:200-202). A statue of the *pueo* at the Kewalo Basin Park symbolizes the importance of this *ʻaumakua* to the *kamaʻāina* of Kakaʻako, and Mr. Iwami intends to incorporate the image of the *pueo* in the logo of Friends of Kewalos, as both the creature and the organization act as protectors of the land and waters of Kewalo Basin.

9.2 Agriculture and Gathering

The *ʻili* of Kakaʻako and surrounding lands remained outside the two most intensely populated and cultivated areas on southeastern Oʻahu—Waikīkī and Honolulu (or Kou)—during pre-Contact times, yet Hawaiians used the lowland marshes, wetlands, salt pans, and coral reef flats for gathering *pili* grass (Thrum 1922:639), salt making and farming of fishponds along with some limited wetland taro agriculture (Kotzebue 1817), and this supported habitation sites clustered around the *mauka* boundary of the Kakaʻako area near Queen and King Streets (LaPasse 1855).

Hawaiians collected salt through several natural and artificial features of the landscape, including salt ponds near the shore that fill with salt water at high tide, drains where the salt water from these pans is transferred to smaller clay-lined or leaf-lined channels, natural depressions in the rocks along the shore where salt formed naturally, and the land that could probably not be used for agriculture as it was impregnated with salt (LCA 1903). The abundance of salt led to the Kakaʻako Salt Works in the late nineteenth century (Hustace 2000:50). Mr. Kamamoto, in a previous oral history interview (UH 1978:622), recollected that salt fields covered the land near Kewalo Basin.

Despite intense dredging and land reclamation in Kakaʻako, knowledge of laʻau lapaʻau and customs of gathering plants from the former marshes near the former coast for medicinal and agricultural purposes continue to be passed on. A confidential participant explains in detail the collection, preparation, and medicinal uses of *ʻuhaloa*, castor beans, guava, *pōpolo*, *tī*, and *māmaki* that were collected and used in the Project vicinity.

Recently, a charter school, Hālau Kū Māna, has taken responsibility of a section of the Kewalo Basin Park by planting a garden with native Hawaiian plants. Signs indicate the following Hawaiian plants with their scientific names: *polinalina* (*Vitex rotundifolia*), *ʻahu ʻawa* (*Mariscus javanicus*), *mauʻuʻakiʻaki* (*Fimbristylis cimosa*), *paʻuohiʻiaka* (*Jacquemontia ovalifolia sandwicensis*), *ʻāweoweo* (a native shrub, *Chenopodium oahuense*), *pohuehue* (beach morning-glory, *Ipomoea pes-caprae brasiliensis*), *maiapilo* (a native shrub, *Capparis sandwichiana*), *ʻaʻaliʻi* (a native shrub, *Dodonaea viscosa*), *maʻo or huluhulu* (native cotton, *Gossypium tomentosum*), *naio* (bastard sandalwood, *Myoporum sandwicense*), *kalo* (taro, *Colocasia esculenta*), *ʻakulikuli* (a coastal herb, *Sesuvium portulacastrum*), and *milo* (a tree, *Thespesia populnea*).

9.3 Marine and Freshwater Resources

Hawaiians farmed fishponds, fished the reefs, and gathered marine resources on the shores of Kakaʻako, and knew the locations of freshwater springs within the wetlands. The *moʻolelo* of Kawaiahaʻo follows a trail between Waikīkī and Honolulu to locate two former freshwater springs—Kewalo Spring and Kawaiahaʻo (Pukui 1988:87-89). Mrs. Kekina describes a spring in the neighboring area of Mōʻiliʻili that Chinese farmers once used to irrigate their rice fields.

While the freshwater springs, ponds and other resources have been filled with the historic land reclamation of the late nineteenth century, Hawaiians and other ethnic groups continue to use a variety of other marine resources. A confidential participant describes the gathering and consumption of several types of limu on the shores of Ala Moana Beach, including *limu ʻeleʻele*, *limu ogo*, and a type of *limu* that grows on *ʻopihi* shells, and mentions reef fish caught at Kewalo Basin, including *ʻāweoweo*, *manini*, *ʻōpelu*, *āholehole*, *ʻamaʻama*, and squid (octopus). Mrs. Kekina adds menpachi to this list. In addition, Mrs. Kekina remembers catching freshwater shrimp in the streams of Mānoa and she hunted crabs and fished in the Ala Wai Canal and along the reefs near the Natatorium and Ala Moana Park.

Mr. Moses, Mr. Nihoa, and most of the previously interviewed *kamaʻāina* of Kakaʻako (UH 1978) speak of the central role of *aku* to the growth of the fishing industry at Kewalo Basin and the identity of the multiple ethnic groups within the surrounding Kakaʻako community. Mr.

Masuda vividly demonstrated the intensity of *aku* fishing in his description of how the *aku* fishermen landed 90 tons of *aku* each night for several weeks at the Hawaiian Tuna Packers in the early twentieth century (UH 1978:839), and Mr. Moses and Mr. Nihoa detail how divers today still surround and catch *nehu* traditionally with nets, which the fishermen then use as bait to catch *aku*.

9.4 Cultural Practices

Previous oral histories of Kakaʻako residents documented the lives of the "unsung heroes" of Kakaʻako from the early twentieth century—the machinists, firemen, cannery workers, and others from diverse ethnic backgrounds that shaped the history of Hawaiʻi (UH 1978). The written memories of Usaburo Katamoto (UH 1978:534-632), Keisuke Masuda (UH 1978:817-876), and other residents paint a picture of their vibrant childhood in Kakaʻako. In the 1930s and 1940s, children surfed on redwood planks at the Kaʻakaukukui reef east of the Kewalo Channel (Clark 1977:64). Others young residents, such Mrs. Kekina and a confidential participant, swam and played with childhood friends in the harbor and cove of Kewalo Basin.

Culinary traditions remain alive for a confidential *kamaʻāina* of Kakaako. He/she explains the preparation of pigs and fish for *lūʻau*. In addition, Mr. Nihoa and Mr. Moses continue the practice of drying *aku* at sea for home consumption.

In the 1960s, the explosive growth of surfing in Waikīkī forced many surfers to explore and discover uncrowded breaks, including the waters of Ala Moana Beach Park and Kewalo Basin (Clark 1977:64). An intense social community of surfers has emerged at Kewalos, a series of four surf breaks adjacent to the harbor entrance in front of the Kewalo Basin Park. Mr. Iwami suggests that the excellent surfing conditions, the short section of oceanfront land, and the single entrance to the park have contributed to the enduring social bonds of the surfers of Kewalos.

9.5 Ala Hele

John Papa ʻĪʻī (1959) discusses early nineteenth-century *ala hele* in the Honolulu and Waikīkī area, including upper, middle, and lower trails that traversed the region of Kakaʻako. The lower trail crossed near the coastline at Kālia, where it must have run on a sand berm raised above surrounding wetlands and coral flats. This original foot path on the "Beach Road" at the edge of the former coastline has been transformed through time to a horse path, buggy and cart path, and finally to the widened Ala Moana Boulevard.

9.6 Historic and Cultural Properties

Puʻukea Heiau, which belonged to the chief Huanuikalalaʻilaʻi, was possibly located on one of the few elevated locations in the Kakaʻako region in the flat, low-lying swamp that surrounded it. *Kāhuna* used *mahiki* grass, which grew on the nearby coast, to exorcise malicious spirits from the afflicted (Pukui and Elbert 1986:219), a concept that still resonates with the contemporary usage of *mahiki* in lines of *hoʻoponopono* inquiry to "peel off" layers of deeper feelings (Pukui et al. 1979:228).

In 1899, Gorokichi Nakasugi, a Japanese shipwright, brought a traditional Japanese sailing vessel, called a *sampan*, to Hawai‘i, and this led to a unique class of vessels and distinctive maritime culture associated with the rise of the commercial fishing industry in Hawai‘i (Van Tilburg 2007). Japanese trained shipwrights adapted the original *sampan* design to the rough waters of the Hawaiian Islands (Krauss 2006), while the fishermen used a traditional live bait, pole-and-line method of fishing and unloaded their catches of *aku* and *ahi* at Kewalo Basin (Van Tilburg 2007:43). In a previous oral history, Mr. Katamoto described the first 35-foot *aku sampan* “sailing in the fair wind” off the Kewalo Basin harbor and Pearl Harbor (UH 1978:534-632). The *sampan* fishing industry declined dramatically following World War II, such that today the *Kula Kai*, built in 1947, is the only surviving vintage wooden *sampan* in Hawai‘i (Krauss 2006). Mr. Moses and Mr. Nihoa represent a sharply declining number of *aku* fishermen with mastery of the traditional methods of fishing and knowledge of *aku sampan*. As such, they can be considered living human treasures of the distinctive Hawaiian *aku sampan* culture.

9.7 Burials

Based on the results of previous archaeological work, it appears that there are intermittent buried cultural layers in the near shore environment reflecting the Hawaiian pattern of permanent settlements in proximity to agriculture, aquaculture, and marine resources. The late nineteenth and early twentieth centuries were an era of intense development of the coasts of Honolulu, Kaka‘ako, and Waikīkī. A number of land reclamation projects dredged offshore areas to deepen and create boat harbors, and used the dredged material to fill in the former swampy land (Nakamura 1979). Kewalo Basin harbor was formerly a shallow reef that enclosed a deep section of water that had been used as a canoe landing since pre-Contact times and probably used since the early historic period as an anchorage. Dredging of the Kewalo Channel began in 1924 (Kewalo Basin Harbor 2009).

As a result of the dredging, no pre-twentieth century burials would be expected in the harbor, and there is no documented evidence from archaeological surveys, historical records, or oral traditions of *ilina* or *iwi kūpuna* within the Project area. However, the adjacent lands of Kaka‘ako contain two large cemeteries and numerous burials, and human skeletal remains were discovered near the former coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002). As a result, early twentieth century human burials and other cultural resources could potentially be located in the extreme inland portion of the Project area adjacent to the *makai* curb of Ala Moana Boulevard, but any lands seaward of the old “Beach Road” were probably too close to the water table and too unstable to have been used for permanent habitation or burials (Hammatt and Shideler 2010).

9.8 Summary

Kaka‘ako was a sparsely inhabited area in the pre-Contact and early post-Contact periods. Hawaiians built their house lots and villages on a high sand berm. This solid land also served as a coastal trail that later became Queen and King Streets. The land *makai* of this trail was a marsh along the coast with salt pans maintained among the many brackish water ponds. Archaeologists have found cultural deposits dating to these periods, but the deposits are usually thin and intermittent, without a great deal of midden remains. This is probably a reflection of the intermittent use of the area by fishermen and salt makers. Historic remains reflect the view of Kakaʻako area as a place apart from Honolulu and Waikīkī. It served as a place of the dying and the dead, of isolation and quarantine, of trash and wastelands, and the poor and the immigrant; however, it also represents the birth of the modern centers of Waikīkī and Honolulu (Griffin et al. 1987:73), especially the birth of *aku* fishing with Hawaiian *sampan* that led to the growth of the fishing industry in Hawaiʻi (Van Tilburg 2007).

Section 10 Summary and Recommendations

CSH undertook this CIA at the request of Helber Hastert & Fee, Planners. The cultural survey broadly included the entire Kakaʻako district, and more specifically the approximately 22 acres of public land of the Kewalo Basin Harbor, TMK: [1] 2-1-058. The HCDA proposes the repair and/or replacement of the existing mooring infrastructure at Kewalo Basin to modernize the facilities, increase its small craft moorage capacity, and improve operational efficiencies.

10.1 Results of Background Research

Background research on the Project area and surrounding area of Kakaʻako indicates (presented in approximate chronological order):

1. The location and extent of the area called Kakaʻako is ambiguous. The modern urban district of Kakaʻako is comprised of the *ʻili* (land section) of Kakaʻako and other lands once part of the extant *ahupuaʻa* (land division usually extending from the uplands to the sea) of Honolulu.
2. The Kakaʻako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation; however, the fill has served as an agency of preservation rather than destruction of the patterns of early Hawaiian life and the remains of nineteenth century Honolulu and Waikīkī (Griffin et al. 1987:73). Much of the *wahi pana* (storied places), *loko iʻa* (fishponds), *heiau* (shrines), and other cultural resources, and natural deposits and land forms of the area have survived below this fill. Accompanying *moʻolelo* (stories, oral traditions), *oli* (chants), *ʻōlelo noʻeau* (proverbs), and *wānana* (prophecies) have been documented that still resonate with Hawaiians of the Kakaʻako district today.
3. The *ʻili* of Kakaʻako and surrounding lands remained outside the two most intensely populated and cultivated areas on southeastern Oʻahu—Waikīkī and Honolulu—during pre-Contact times, yet Hawaiians used the lowland marshes, wetlands, salt pans, and coral reef flats for salt making and farming of fishponds along with some limited wetland taro agriculture (Kotzebue 1817), and this supported habitation sites clustered around the *mauka* (inland) boundary of the Kakaʻako area near Queen and King Streets (LaPasse 1855).
4. The salt marshes were excellent places to gather pili grass for the thatching of houses, which may have led to the name Kakaʻako (prepare the thatching) (Thrum 1922:639). *Moʻolelo* point to the coastal marshes of Kewalo as the habitat of the original *pueo* (owl) that became one of the Hawaiians' *ʻaumākua* (deified ancestors) (Westervelt 1963:135–137; Thrum 1998:200–202). The *moʻolelo* of Kawaiahaʻo follows a trail between Waikīkī and Honolulu to locate two freshwater springs—Kewalo Spring and Kawaiahaʻo (The Waters of Haʻo) (Pukui 1988:87–89), which highlights its location between the two main population centers.
5. Kewalo was once associated with a spring called Kawailumalumai (drowning waters, Sterling and Summers 1978:292) that was used to sacrifice *kauwā*, or members of a

pariah caste, designed for the *heiau* of Kānelāʻau on the slopes of Pūowaina (Punchbowl) as the first step in a drowning ritual known as Kānāwai Kaiheheʻe (Kamakau 1991:6) or Ke-kai-heʻeheʻe (sea sliding along) (Westervelt 1963:16).

6. Puʻukea Heiau (white hill), which belonged to the chief Huanuikalalaʻilaʻi, was possibly located on one of the few elevated locations in the flat, low-lying swamp that surrounded it. *Kāhuna* (priests) used *mahiki* (a kind of grass) of Puʻukea, which grew on the nearby coast, to exorcise malicious spirits from the afflicted (Pukui and Elbert 1986:219), a concept that still resonates with the contemporary usage of *mahiki* in lines of *hoʻoponopono* (family conference in which relationships are set right) inquiry to "peel off" layers of deeper feelings (Pukui et al. 1972:228).

7. Land Commission Award (LCA) documents reveal that much of the land in Kakaʻako was used to produce salt, including: salt ponds near the shore that filled with salt water at high tide (*ālia*), drains where the salt water from these pans was transferred to smaller clay-lined or leaf-lined channels (*hoʻoliu*), natural depressions in the rocks along the shore where salt formed naturally (*poho kai*), and land (*kula*) that could probably not be used for agriculture as it was impregnated with salt (LCA 1903). The abundance of salt led to the Kakaʻako Salt Works in the late nineteenth century (Hustace 2000:50).

8. The Kakaʻako area continued to remain outside Waikīkī and Honolulu during the post-Contact era. It served as a place of the dying and the dead, of isolation and quarantine, of trash and wastelands, and the poor and the immigrant; however, it also represents the birth of modern Waikīkī and Honolulu (Griffin et al. 1987:73). Specifically in this area: victims of the 1853 smallpox epidemic were quarantined in a camp (Thrum 1897:98) and those that did not survive were buried at Honuakaha Cemetery (Griffin et al. 1987:13); Hansen's Disease patients were treated in the Kakaʻako Leper Branch Hospital (Griffin et al. 1987:55); victims of the 1895 cholera epidemic were treated at the Kakaʻako Hospital (Thrum 1897:101); infected patients of the 1899 bubonic plague were moved to a quarantine camp; animals were quarantined in a station in 1905; and the city's garbage was burned in an incinerator at Kewalo Basin (UH 1978).

9. After the annexation of the Hawaiian Islands by the United States in 1898, the U.S. Congress began to plan for the coastal defenses of their new islands, which included Fort Armstrong on the Kaʻākaukukui Reef as a station for the storage of underwater mines. In 1911, the Honolulu Rifle Association, and possibly other groups, used the flat, uninhabited Kakaʻako lands near the coast as a rifle range (Williford and McGovern 2003:15).

10. The late nineteenth and early twentieth centuries were a time of intense development of the coasts of Honolulu, Kakaʻako, and Waikīkī. A number of land reclamation projects dredged offshore areas to deepen and create boat harbors, and used the dredged material to fill in the former swampy land. Kakaʻako became a prime spot for large industrial complexes, such as iron works, lumber yards, and draying companies (Nakamura 1979).

11. Kewalo Basin harbor was formerly a shallow reef that enclosed a deep section of water that had been used as a canoe landing since pre-Contact times and probably was used since the early historic period as an anchorage. Dredging of the Kewalo Channel began in

1924, but by the time the concrete wharf was completed in 1926, the lumber import business had faded, so the harbor was used mainly by commercial fishermen. In 1941, the government dredged and expanded the basin to its current 22 acres. In 1955, workers placed the dredged material along the *makai* (seaward) side to form an eight-acre land section protected by a revetment—now the Kewalo Basin Park (Kewalo Basin Harbor 2009).

12. In 1899, Gorokichi Nakasugi, a Japanese shipwright, brought a traditional Japanese sailing vessel, called a *sampan*, to Hawai‘i, and this led to a unique class of vessels and distinctive maritime culture associated with the rise of the commercial fishing industry in Hawai‘i (Van Tilburg 2007). Japanese-trained shipwrights adapted the original *sampan* design to the rough waters of the Hawaiian Islands (Krauss 2006). The fishermen used a traditional live bait, pole-and-line method of fishing and unloaded their catches of *aku* (bonito, skipjack) and *ahi* (yellow-fin tuna) at Kewalo Basin (Van Tilburg 2007:43). The *sampan aku* fleet relocated to Kewalo Basin by 1930, and the McFarlane Tuna Company (now Hawaiian Tuna Packers) built a shipyard there in 1929 and a new tuna cannery at the basin in 1933 (Clark 1977:64). The *sampan* fishing industry declined dramatically following World War II, such that today the *Kula Kai*, built in 1947, is the only surviving vintage wooden *sampan* in Hawai‘i (Krauss 2006).

13. Previous oral histories of Kaka‘ako residents documented the lives of the “unsung heroes” of Kaka‘ako from the early twentieth century—the machinists, firemen, cannery workers, and others from diverse ethnic backgrounds that shaped the history of Hawai‘i (UH 1978). Many of the interviewees were of Japanese descent, and many of their fathers were fishermen who settled in Kaka‘ako to have access to the waterfront. Usaburo Katamoto, a boat builder, described 35-foot *aku sampan* “sailing in the fair wind” off the Kewalo Basin harbor and Pearl Harbor, and that he used to dray the newly built vessels with a team of a dozen mules (UH 1978:534-632). Keisuke Masuda, a foreman at Hawaiian Tuna Packers, described in detail how at night he and a small crew of transient Filipinos unloaded the fish from the *sampan*, weighed the fish, operated the boiler, and steamed the fish, and how 200 Japanese women cleaned the fish and packaged the canned tuna (UH 1978:817-876).

14. As a result of the dredging, no pre-twentieth century burials or other pre-twentieth century finds would be expected in the immediate vicinity of the harbor, and there is no documented evidence from archaeological surveys, historical records, or oral traditions of *ilina* (graves) or *iwi kūpuna* (ancestral remains) within the Project area. However, the adjacent lands of Kaka‘ako contain two large cemeteries and numerous burials, and human skeletal remains were discovered near the former coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002). Further, the original foot path at the edge of the former coastline has been transformed through time to a horse path, buggy and cart path, and finally to the widened Ala Moana Boulevard. As a result, early twentieth century human burials and other cultural resources could potentially be located adjacent to the *makai* curb of Ala Moana Boulevard, but any lands seaward of the old trail were probably too close to the water

table and too unstable to have been used for permanent habitation or burials (Hammatt and Shideler 2010).

15. During the first half of the twentieth century, the marshlands and rice fields in the Kakaʻako district were filled to accommodate the expanding urbanization of Honolulu. Poverty-stricken settlements arose in the 1920s, camps of Hawaiians, Portuguese, Chinese, and Japanese settlers developed in the 1930s, and the area became increasingly industrial in the 1940s. In the 1960s, the explosive growth of surfing in Waikīkī forced many surfers to explore and discover uncrowded breaks, including the waters of Ala Moana Beach Park and Kewalo Basin (Clark 1977:64).

10.2 Results of Community Consultation

10.2.1 Consultation Efforts

CSH attempted to contact 39 community members, government agency and community organization representatives, and individuals, including residents, cultural and lineal descendants, and cultural practitioners. Of the 16 people that responded, six *kūpuna* and/or *kamaʻāina* participated in formal interviews for more in-depth contributions to the CIA. This community consultation indicates:

1. *Wahi pana* and *moʻolelo* associated with the Project vicinity reveal a strong connection to past traditions and a renewed salience of those traditions today. Mr. Kapanui explains that Hawaiians traditionally dedicated newly constructed *heiau* to the war god Kū and other primary male gods and christened special events with human sacrifices. He shares a *moʻolelo* of sacrificial drowning at the waters of Kewalo Basin and an inland pond located at the current Blaisdell Center site, a story that Mr. Kapanui uses today to enrapture visitors. According to Mr. Kapanui, *aliʻi* (chiefs) associated with two sacrificial *heiau*—Kānelāʻau Heiau on the slopes of Punchbowl Crater and a *heiau* near the former coastline at the Kawaiahaʻo Church—required that members of the low *kauwā* caste were strangled underwater to ensure the victim's body remained intact without excessive blood and bruises.

2. The identity of the descendents of former Kakaʻako residents is influenced by *moʻolelo* of the area as a place of coral flats, landfill, dumps, disease, and death. Mr. Kapanui describes how the smallpox epidemic of 1853 ravaged Hawaiʻi. According to Mr. Kapanui, over 3,000 small pox victims were buried in mass graves near the former coastline at Restaurant Row and the old Kakaʻako Fire Station. Older firemen have shared with Mr. Kapanui their experiences of ghost haunting there.

3. *Kamaʻāina* of Kakaʻako fondly reminisce about the diverse ethnic neighborhoods of Kakaʻako and the recreational use of the waterfront during the 1930s and 1940s. A confidential participant portrays the vibrant and interactive character of the Japanese, Chinese, Filipino, and Portuguese immigrant families. Mrs. Kekina remembers swimming in the harbor and cove of Kewalo Basin and nearby reefs.

4. Despite intense dredging and land reclamation in Kakaʻako, knowledge of *lāʻau lapaʻau* (traditional plant medicine) and customs of gathering plants for medicinal and

agricultural purposes continue to be passed on by Hawaiians of Kakaʻako. A confidential participant explains in detail the collection, preparation, and medicinal uses of the following plants: *ʻuhaloa*, castor beans, guava, *pōpolo*, *tī*, and *māmaki*, as well as the gathering and consumption of several types of *limu* (seaweed), including *limu ʻeleʻele*, *limu ogo*, and a type of *limu* that grows on *ʻopihi* (limpets) (see Appendix B for common and scientific plant and animal names mentioned by community participants).

5. The historic era of *aku* fishing and *sampan* of Kewalo Basin still resonates with community members today. Mrs. Kekina gives a voice to the few remaining descendents of the original Japanese immigrant fishermen of the early twentieth century. Her father worked as the shipyard foreman for Hawaiian Tuna Packers and built *sampan* boats for *aku* fishing. Mr. Moses describes the small, vibrant community of *aku sampan* fishermen in the late 1960s. The crew regularly gathered on the shore of the harbor on the present-day eastern parking lot and later in a small building near the harbor entrance (now used by the charter school Hālau Kū Māna) to repair their nets, which reached lengths of 200-300 yards. Several fishermen continue to practice the swiftly declining unique maritime tradition of *aku sampan* fishing. Mr. Nihoa and Mr. Moses describe the unique specificity of the Japanese-designed *sampan aku* boats and detail the techniques of *aku* fishing.
6. The waters of Kewalo Basin once contained numerous reef fish. Mrs. Kekina fished at the Kewalo Cove for menpachi, which her mother then cooked for an exceptional recipe of miso soup and a confidential participant caught several reef fish at Kewalo Basin, including *ʻāweoweo*, *manini*, *ʻōpelu*, *āholehole*, *ʻamaʻama*, and squid (octopus).
7. According to Mr. Iwami, the charter school Hālau Kū Māna leases the old net house at the Kewalo Basin Park and maintains a garden near the harbor channel of at least 13 native Hawaiian plant species. (See Section 9.2 for Hawaiian and scientific names of these plants as they appear on labeled signs).
8. Traditional Hawaiian culinary practices live on for *kamaʻāina* of Kakaʻako. A confidential participant explains the preparation of pigs and fish for lūʻau (feasts). In addition, Mr. Nihoa and Mr. Moses continue the practice of drying *aku* at sea for home consumption. The boat they work on is evidence of the continued consumption of fresh *aku* as well.
9. A tight-knit intense social community of surfers has emerged at “Kewalos,” a series of four surf breaks adjacent to the harbor entrance in front of the Kewalo Basin Park. Mr. Iwami describes the meanings of the surf breaks (Marine Land, Straight Outs, Rennicks/Right Next, and the Point), as well as the neighboring body surfing break located west of the harbor channel in front of the Kakaʻako Waterfront Park (Point Panic). Mr. Iwami suggests that the excellent surfing conditions, the short section of oceanfront land, and the single entrance to the park have contributed to the enduring social bonds of the Kewalos surfers.
10. The respondents are not aware of any cultural or historic properties, including *ilina* or *iwi kūpuna*, within or adjacent to the current Project area. However, Mr. Moses and Mr. Nihoa highlight the cultural significance of the *Kula Kai*, the last of the original wooden

sampan aku boats in Hawaiʻi which was built just after World War II and is docked at Kewalo Basin.

10.2.2 Community Recommendations

Based on the community consultations, there are six major concerns regarding potential adverse impacts on cultural, historic and natural resources, practices and beliefs as a result of the proposed Project (presented in alphabetical order):

1. **Accessibility**. Ms. Cayan and Mr. Iwami recommend that public access to the Kewalo Basin Park, shoreline, and ocean should not be blocked during construction and that alternatives for access, including adequate parking stalls, become available. Ms. Stevens also feels that the harbor needs more visibility. She does not want the view from Ala Moana blocked, and suggests that buses remain off-site and that rental cars have free parking.
2. **Cultural Preservation**. Several respondents articulate their concerns for the preservation of cultural practices, resources, and artifacts. Ms. Stevens calls for the preservation of the historic *aku* fishing. She specifically suggests discounting the *aku* fishermen's mooring fees and offering tours to preserve the history of *aku* fishing in Hawaiʻi. Mr. Moses and Mr. Nihoa highlight the cultural significance of the *Kula Kai* as the last vintage Hawaiian wooden *sampan aku* boat. Ms. Sevens also calls for the preservation of the tourism based businesses, including parasail, party boat, and sport fishing, and the Kewalo Keiki Fishing Conservancy.
3. **Pollution**. Mr. Nāmuʻo (representing the Office of Hawaiian Affairs), Mr. Iwami (representing Friends of Kewalos), and Mr. Kapanui are concerned with controlling the marine debris, pollutants, and other foreign matter that endanger or harm marine resources, water quality, and the fragile Hawaiian ecosystems. Specifically, Mr. Iwami suggests that toxic and hazardous substances generated during the construction phase could flow out to the nearby fishing and surfing areas, including the surf spots on the Diamond Head side and the ʻEwa side of the harbor channel, and that the addition of slips means that more boats can potentially leak more hazardous materials into the ocean. Mr. Nāmuʻo stresses that the reefs and marine life found within the near- and off-shore waters are not merely resources, but are the foundation of life to Hawaiians.
4. **Slips**. Mr. Moses and Mr. Nihoa are concerned about the maneuverability of their vessel, the *Kula Kai*. As the last vintage wooden *sampan aku* boat, the *Kula Kai* is powered by a single prop, which creates a very slow turning radius for the length of the hull. To leave the harbor, the *Kula Kai*, which is docked near the entrance to the harbor, must slowly and carefully reverse out of its slip so as to not hit the nearby vessels docked on the opposite slip. The distance to the next slip is barely longer that the 89 feet of the *Kula Kai* itself, so Mr. Nihoa must repeatedly reverse and move forward in small turning increments to safely pilot the *Kula Kai* out of its slip. Based on this established pattern of leaving the slip, Mr. Moses is concerned that the addition of slips and accompanying vessels will further diminish the maneuverability of the *Kula Kai* at the harbor, which, in turn, could affect its capacity to leave the harbor and make a profit at *aku* fishing. In addition, Ms. Stevens recommends not developing Kewalo Basin as a "mega yacht" harbor, as it is too far and

too expensive for these type of yachts to come in large numbers to Hawai‘i. She suggests that only five to ten berths be set aside for transient yacht type vessels of 75-150 feet in length, as they desire shore power, security and privacy.

5. **Surfing**. Mr. Iwami and Mr. Young are concerned that the Project may impact surfing at “Kewalos.” Increasing the number of slips from 143 to 250 will drastically increase the amount of boats going in and out of the channel. This may form a chop that ruins the surfing waves and increases the chance of accidents. In addition, Mr. Iwami does not want to see any changes to the harbor channel, such as dredging to widen the channel, as this will directly impact the recreational usage of the area.
6. **Tourism**. Ms. Stevens suggests borrowing ideas from the Fishing Village at Pier 38 to better attract locals and tourists. Ms. Stevens lists six specific ways for the harbor to become more attractive: create a historical marker on the Trolley Tour, including the 100 year history of the Hawaiian Tuna Packers cannery; promote the sport fishing business while giving clients the option to keep the fish they catch; stop the wedding chapels on the western side of the harbor; maintain the John Dominus restaurant; beautify the adjacent road with landscaping; reduce the feral cat population; and relocate the homeless.

10.3 Project Impacts

Based on the information gathered from archival documents, archaeological research, and community consultation detailed in the CIA report, CSH has determined that there are no direct impacts of the Project on Native Hawaiian or other ethnic groups’ cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes. There are, however, three potential indirect cultural impacts:

1. The landscape surrounding Kewalo Basin contains four cultural and historic features, including a statue at the harbor entrance that enshrines the *pueo* as the protector of the Kaka‘ako area; an honorific statue of the Blessed Mother Marianne Cope for her historic efforts in battling Hansen’s disease; a Native Hawaiian garden of Hālau Kū Māna with its numerous medicinal and agricultural plants; and the net house, a structure originally designed for the repair of the *aku sampan* fishermen’s *nehu* nets. According to Helber Hastert & Fee, Planners, the Project will not extend to land uses other than utility improvements at the wharfside. However, Project construction may indirectly impact cultural activities associated with Hālau Kū Māna, which is located adjacent to the Project area. Based on a CSH site visit and discussions with Mr. Iwami, this charter school centers on cultural education, including the construction of outrigger paddling canoes and the maintenance of the Native Hawaiian garden. Construction-related noise may adversely affect these and other cultural practices and any associated religious activities (e.g. prayers).
2. Cultural and recreational activities, such as surfing, paddling, and fishing, occur in the near-shore waters outside of Kewalo Basin. If the Project construction or operation results in adverse water quality impacts that extend outside the harbor, there may be impacts to these activities. According to Helber Hastert & Fee, Planners, marine resources and water quality studies are now being prepared and will evaluate potential

impacts of the construction and increased slip count on the marine environment, and address mitigation measures if appropriate.

3. Kewalo Basin harbors the *Kula Kai*, the last vintage example of a unique class of maritime vessel and type of fishing (*aku sampan*). According to Helber Hastert & Fee, Planners, the Project has been designed to accommodate all existing harbor users, including the *Kula Kai*. However, construction-related impacts may affect the maneuverability of the vessel to leave the harbor in the short-term, which, in turn, could affect its long-term sustainability. Mr. Moses and Mr. Nihoa specifically state that the single prop of the *Kula Kai* forces a very wide turning radius for the extreme length of the hull. Water-based construction (e.g. barges) of the slips near the *Kula Kai* may further diminish the space for its maneuverability, and any addition of nearby slips and accompanying vessels may continue to diminish the long-term maneuverability of the *Kula Kai*.

10.4 Recommendations

Based on the information gathered from archival documents, archaeological research, and community consultation detailed in the CIA report, CSH recommends the following four measures for the proposed Project to mitigate potentially adverse effects on cultural, historic and natural resources, practices, and beliefs:

1. Land-disturbing activities at the wharf near Ala Moana Boulevard—the former coastline—may uncover burials or other cultural resources. Should cultural or burial sites be identified during ground disturbance, all work should immediately cease and the appropriate agencies notified pursuant to applicable law.
2. Community members and organizations should be briefed and consulted as the Project design progresses. This will keep them informed of any changes that could result in unanticipated adverse cultural impacts. In particular, Mr. Moses and Mr. Nihoa represent a sharply declining number of *aku* fishermen with mastery of the traditional methods of fishing and knowledge of *aku sampan*. As such, they can be considered living human treasures of the distinctive Hawaiian *aku sampan* culture and could be utilized as expert community consultants. According to Helber Hastert & Fee, Planners, the *Kula Kai* has a representative on the Kewalo Basin Stakeholders Advisory Group, which has been briefed several times on the proposal, and will continue to be briefed as the design progresses.
3. Protect the Native Hawaiian garden and cultural activities of Hālau Kū Māna from construction-related debris and activity during Project construction.
4. Implement best management practices to reduce or avoid impacts of the construction and increased slip count on the marine environment and nearby water-based recreational and cultural activities, such as surfing at the four "Kewalos" surf breaks.

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Appendix A Glossary

To highlight the various and complex meanings of Hawaiian words, the complete translations from Pukui and Elbert (1986) are used unless otherwise noted. In some cases, alternate translations may resonate stronger with Hawaiians today; these are placed prior to the Pukui and Elbert (1986) translations and marked with “(common).”

Diacritical markings used in the Hawaiian words are the *‘okina* and the *kahakō*. The *‘okina*, or glottal stop, is only found between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels. The pronunciation of the *‘okina* is similar to saying “oh-oh.” The *‘okina* is written as a backwards apostrophe. The *kahakō* is only found above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The *kahakō* is written as a line above a vowel.

Hawaiian Word	English Translation
ahupua‘a	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (*ahu*) of stones surmounted by an image of a pig (*pua‘a*), or because a pig or other tribute was laid on the altar as tax to the chief.
ala hele	Pathway, route, road, way to go, itinerary, trail, highway, means of transportation.
ali‘i	Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander.
‘aumakua	Family of personal gods, deified ancestors who might assume the shape of sharks, owls, hawks (etc…). A symbiotic relationship existed; mortals did not harm or eat *‘aumakua*, and *‘aumakua* warned and reprimanded mortals in dreams, visions, and calls. *‘Aumākua*—plural of *‘aumakua*.
heiau	Pre-Christian place of worship, shrine; some *heiau* were elaborately constructed stone platforms, others simple earth terraces. Many are preserved today.
ho‘oponopono	Mental cleansing: family conferences in which relationships were set right (*ho‘oponopono*) through prayer, discussion, confession, repentance, and mutual restitution, and forgiveness.
‘ili	Land section, next in importance to an ahupua‘a and usually a subdivision of an *ahupua‘a*.
ilina	Grave, tomb, sepulcher, cemetery, mausoleum, plot in a cemetery.
iwi kūpuna	Ancestral bone remains (common).

kahuna	Priest, sorcerer, magician, wizard, minister, expert in any profession. *Kāhuna*—plural of *kahuna*.
kalana	Division of land smaller than a moku or district; county.
kamaʻāina	Native-born, one born in a place, host; native plant; acquainted, familiar, Lit., land child.
kapu	Taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out.
kauwā	Outcast, pariah, slave, untouchable, menial; a caste which lived apart and was drawn on for human sacrifices.
kolowalu	Name of a law in the time of Kūaliʻi safeguarding the rights of commoners.
kula	Plain, field, open country, pasture. An act of 1884 distinguished dry or kula land from wet or taro land.
kuleana	Native Hawaiian land rights (common). Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province.
kupuna	Elders (common). Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle. *Kūpuna*—plural of *kupuna*.
lāʻau lapaʻau	Traditional plant medicine (common). Medicine. Lit. Curing medicine.
lele	A detached part or lot of land belonging to one ʻili and located in another.
loʻi	Irrigated terrace, especially for taro, but also for rice; paddy.
loko iʻa	Fishpond (common).
lūʻau	Hawaiian feast, named for the taro tops always served at one.
makai	Seaward.
mauka	Inland.
moku	District, island, islet, section.
moʻolelo	Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. (From *moʻo ʻōlelo*, succession of talk; all stories were oral, not written).

ʻōlelo noʻeau	Proverb, wise saying, traditional saying.
oli	Chant that was not danced to, especially with prolonged phrases chanted in one breath, often with a trill at the end of each phrase; to chant thus.
poho kai	Hollow where sea remains at low tide.
poi	*Poi*, the Hawaiian staff of life, made from cooked taro corms, or rarely breadfruit, pounded and thinned with water.
sampan	A flat-bottomed Chinese skiff usually propelled by two short oars [Chinese] (Webster's Dictionary 1990)
wahi pana	Storied place (common). Legendary place.
wānana	Prophecy.

Appendix B Common and Scientific Names for Plants and Animals Mentioned by Community Participants

Common Names		Possible Scientific Names		Source
Hawaiian	**Other**	**Genus**	**Species**	
āholehole	juvenile *āhole* (Hawaiian flagtail)	*Kuhlia*	*xenura*	Hoover 2003
aku	bonito, skipjack	*Katsuwonus*	*pelamis*	Hawai‘i Seafood Council 2010
akule	big-eyed scad	*Selar*	*crumenophthalmus*	Hoover 2003
‘ama‘ama	striped mullet	*Mugil*	*cephalus*	Hoover 2003
‘āweoweo	bigeye	*Heteropriacanthus*	*cruentatus*	Hoover 2003
‘āweoweo	bigeye	*Priacanthus*	*meeki*	Hoover 2003
kalo	taro	*Colocasia esculenta*	*esculenta*	Wagner et al. 1999
kukui	candlenut	*Aleurites*	*moluccana*	Wagner et al. 1999
haole koa		*Leucaena*	spp. *	Wagner et al. 1999
laua‘e	fern	*Phymatosorus*	*grossus*	Imada et al. 2005
limu ‘ele‘ele	seaweed, algae	*Entermorpha*	*prolifera*	Abbott and Williamson 1974
limu ogo (*manauea*)	seaweed, algae	*Gracilaria*	*parvispora*	Guiry and Guiry 2010
mahimahi	dolphin fish	*Coryphaena*	*hippurus*	Hawai‘i Seafood Council 2010
māmaki		*Pipturus*	spp.*	Wagner et al. 1999
manini	convict tang	*Acanthurus*	*triostegus*	Hoover 2003

Common Names		**Possible Scientific Names**		**Source**
Hawaiian	**Other**	**Genus**	**Species**	
nehu	smelt	*Stolephorus*	*purpureus*	Titcomb 1972
ono	wahoo	*Acanthocybium*	*solandri*	Hawai‘i Seafood Council 2010
‘ōpelu	mackeral scad	*Decapterus*	*macarellus*	Hoover 2003
‘opihi	limpet	*Cellana*	spp.	Pukui and Elbert 1986
pueo	Hawaiian short eared owl	*Asio*	*flammeus sandwichensis*	**Hawai‘i Department of Land and Natural Resource 2005**
tī		*Cordyline*	*fruticosa*	Wagner et al. 1999
‘uala	sweet potato	*Ipomoea*	*batatas*	Wagner et al. 1999
‘ū‘ū	*menpachi* , soldierfish	*Myripristis*	spp.*	Randall 1996
‘uhaloa	American weed	*Waltheria*	*indica*	Wagner et al. 1999
kuawa	guava	*Psidium*	*guajava*	Wagner et al. 1999

* spp. = multiple species

Appendix C Authorization and Release Form

Cultural Surveys Hawaiʻi, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawaiʻi 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

Job code: Kakaako 25 jgenz@culturalsurveys.com www.culturalsurveys.com

AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawaiʻi (CSH) appreciates the generosity of the *kūpuna* and *kamaʻāina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the Cultural Impact Assessment for the *ahupuaʻa* of Kakaʻako.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. If recorded, you will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. If recorded, you will be given a copy of the interview notes for your records.
4. You will be given a copy of this release form for your records.
5. You will be given any photographs taken of you during the interview.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, ______________________________, agree to the procedures outlined above and, by my
(Please print your name here)
signature, give my consent and release for this interview to be used as specified.

____
(Signature)

____
(Date)

Appendix D Community Consultation Letter

Cultural Surveys Hawaiʻi, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawaiʻi 96734 Ph: (808) 262-9972 Fax: (808) 262-4950
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February 11, 2010

Aloha e Kāua,

At the request of Helber, Hastert & Fee Planners, Cultural Surveys Hawaiʻi (CSH) is conducting a Cultural Impact Assessment (CIA) for the Kewalo Basin Repairs Project, Kakaʻako Ahupuaʻa, Kona District, Island of Oʻahu (TMK [1] 2-1-058). The approximate 22-acre Project area encompasses the Kewalo Basin Harbor.

The Hawaiʻi Community Development Authority proposes the repair and/or replacement of the existing mooring infrastructure at Kewalo Basin to modernize the facilities, increase its small craft moorage capacity, and improve operational efficiencies. All in-water work would take place within the existing harbor boundaries (see aerial photo). The Project will be constructed in phases over the several years according to funding availability.

Kewalo Basin currently provides 143 slips and 9,170 lineal feet of moorage. Much of the existing mooring infrastructure is aging and in disrepair. The proposed full build-out includes the demolition and replacement of all existing in-water piers and slips in the harbor, and reconfiguration of piers and slips to optimize mooring capacity. At full build-out, the project will increase the number of slips by about 75% and the total linear moorage capacity by about 45%. No changes to existing bulkheads (wharves) are planned, except to improve existing utilities serving the piers. Shoreside work would be limited to some localized utility trenching that may be necessary to tie-in to the existing utilities; however, these are expected to be limited to the areas directly adjacent to the existing piers.

An alternative is in-kind replacement of existing piers—i.e., replacing the piers and in-water infrastructure, but retaining the same slip capacity in the same configurations. However, this is not the preferred alternative as it does not provide long-term modernization of the harbor.

The purpose of this CIA is to evaluate potential impacts to cultural practices and resources as a result of the proposed development in Kakaʻako Ahupuaʻa. We are seeking your *kōkua* and guidance regarding the following aspects of our study:

- **General history and present and past land use of the Project area.**
- **Knowledge of cultural sites which may be impacted by future development of the Project area - for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the Project area both past and ongoing.**

- **Cultural associations of the Project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kamaʻāina* who might be willing to share their cultural knowledge of the Project area and the surrounding *ahupuaʻa* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the Project area.**

I invite you to contact me, Joe Genz, at 262-9972 or send me an email at jgenz@culturalsurveys.com if you have any information you would like to share.

Mahalo nui,

Joe Genz

Appendix E SHPD Response Letter

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

February 26, 2010

MEMORANDUM

Log No: 2010.0430
Doc No: 1002PC013

TO: Joe Genz, Cultural Surveys Hawaii, Inc.
P.O. Box 1114, Kailua, Hawaii 96734

FROM: Phyllis Coochie Cayan, History and Culture Branch Chief

Subject: KAKAAKO 25: Cultural Impact Assessment (CIA) for the Kewalo Basin Repairs Project, Kaka'ako Ahupua'a, Kona District, Island of O'ahu. TMK: (1) 2-1-058.

Mahalo for the opportunity to comment on a CIA for the Kewalo Basin Repairs Project under the Hawai'i Community Development Authority (HCDA) to repair and /or replace existing mooring infrastructure and modernize the facilities, increase small craft moorage capacity, and improve operations efficiency.

The SHPD recommends you all initiate community talk story efforts with the immediate ocean users that include but are not limited to the regular swimmers, surfers, fisher folks, and stand up boarders, kayakers, canoe clubs and park users. DLNR's ocean and recreation staff may be able to kokua with the regular users of the project area. Also, HCDA's recent round of information to the public on their plans for the mauka Kaka'ako parcels generated a list of concerned citizens as well as former families/individuals who know of Kaka'ako's history and cultural lifestyle from the 1900's.

Because most of the work will be in previously disturbed areas, be mindful that often makai sandy deposits when encountered (although most of this area is fill) sometimes reveal burials or related cultural resources in any ground disturbance activities. The department also recommends that public access is not blocked and that alternatives (including adequate parking stalls) are available for the public to have access to the ocean, the shoreline and the park.

You may want to contact the following persons and/or groups for more comment on cultural impacts:

UH-Manoa Oral History Library for Kaka'ako 'ohana Interviews in their archives
Desoto Brown, Bishop Museum
Na Kupuna at the Waikiki Community Center (contact Jeff Apaka)
George Downing of Downing Hawaii, kupuna and surfer/fisherman

Any questions may be directed to me at 808-692-8025 or by email to Phyllis.L.Cayan @hawaii.gov. We look forward to your comprehensive CIA report on this proposed project.

C: Nancy McMahon, Deputy SHPO/State Archaeologist

Appendix F OHA Response Letter

PHONE (808) 594-1888 FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD10/4830

March 4, 2010

Joe Genz
Cultural Surveys Hawai`i
P.O. Box 1114
Kailua, Hawai`i 96734

RE: Cultural Impact Assessment consultation
Kewalo Basin Repairs Project
Kaka`ako Ahupua`a, Kona District
Tax Map Key: (1) 2-1-058

Aloha e Mr. Genz:

The Office of Hawaiian Affairs (OHA) is in receipt of your February 10, 2010 letter initiating consultation and seeking comments ahead of a cultural impact assessment (assessment) for the Kewalo Basin Repairs Project. According to the information in your letter, the area of interest is about a 22-acre project in the Kaka`ako Ahupua`a which encompasses the Kewalo Basin Harbor.

Your letter details that this project proposes the repair and/or replacement of the existing mooring infrastructure at Kewalo Basin. Based on the information within your letter, project activities include the demolition, reconfiguration, and replacement of all existing in-water piers and slips in Kewalo Basin. OHA is concerned with maintaining and controlling the marine debris, pollutants and any foreign matter that may endanger or cause harm to marine resources, water quality and our fragile Hawaiian reef ecosystems. While OHA recognizes the need for upgrades and improvements to the Kewalo Basin piers and slips we strongly advocate for the protection of our ocean environment.

We seek assurances that best management practices will be implemented and employed during the proposed repair and/or replacement of the existing mooring infrastructure at Kewalo Basin to ensure the protection of marine resources and water quality.

Joe Genz
Cultural Surveys Hawai`i
March 4, 2010
Page 2 of 2

In traditional Hawaiian thinking, natural and cultural resources are one and the same. There is interconnectivity between all resources from the skies and highest mountain peaks, through the valleys and lava plains, to the shoreline and into the depths of the ocean. Hawaiian genealogical chants link man not only to primary gods and the deified chiefs born into the living world, but also to the stars in the heavens and the plants and animals on earth. The first and seconds chants of the sacred Kumulipo detail that in the darkness at the beginning of time were born the coral polyp, sea cucumbers, shellfish, and seaweeds, which were then followed by larger marine life.

With this in mind, it is important to acknowledge that the reefs and marine life found within the near and off shore waters of Hawai'i are not merely resources for man, but are the building blocks of life in the physical Hawaiian world. OHA continues to advocate for the preservation and protection of our cultural and natural resources. We respect the ocean as an extension of our Hawaiian people.

OHA recommends consultation be initiated with the following organizations who may be willing to share their mana`o regarding this assessment: Kewalo Park Association, Ka Hui O Malama Kaka`ako Paka, Save Our Kaka'ako Coalition and Kai Makana. We are also aware of the many ocean activities occur in the Kewalo Basin area on a daily basis. These include many local outrigger canoe clubs that gather for practice, individuals who access this area for subsistence fishing, swimming, and surfing. Please know that this list is not all encompassing and we are sure additional individuals will be identified as you move forward with your consultation process.

Thank you for initiating consultation at this early stage and we look forward to the opportunity to review the completed assessment. Should you have any questions, please contact Kathy Keala at 594-1848 or kathyk@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

Appendix G Friends of Kewalos Response Letter

Friends of Kewalo Basin Park Association
www.kewalo.org

Friends of Kewalos just became a Non- Profit 501 C3 organization in March 2010. Our mission is to ***Protect and Preserve Kewalo Basin Park and the surrounding shoreline and ocean to ensure that the recreational user will continue to have access and the ability to enjoy the area for future generations to come.***

I have been recreating in this area for about 40 years of my life. In my youth, I remember walking on a small trail with my friends under the cover of hale koa bushes to the surf spot called the Point. Here we surfed to our hearts content and hung out like normal teenagers. There was a hill situated where the NOAA installation is located, where we would climb up and it felt like you were sitting on top of the world while looking at the beautiful ocean and dreaming of the care free life.

I am 54 years old now, a retired Fire Captain, and you can still find me at Kewalos. During the years, I have made so many friends or soul mates as surfing is good for the soul. We all share the same desire to come to Kewalos to exercise and be with friends. It has become like the TV show "Cheers" where everybody knows your name. I am just one of many who share this feeling.

Friends of Kewalos continues to be vigilant to protect this very special place. The following are our points of concern:

1. Toxic and hazardous substances that are generated during the construction phase could flow out to the nearby surfing and fishing areas. There are surf spots on the Diamond Head side and the Ewa side of the harbor channel. Not only a danger to the public but also to the marine life.

2. Increasing the number of slips from 143 to 250 will drastically increase the amount of boats going in and out of the channel which causes a chop to form that ruins the waves and increases the chance of an accident to happen.

3. More slips means more boats that can possibly leak hazardous materials into the ocean.

4. Ensure public access is not impacted during and after the construction phase with no decrease in parking.

5. Friends do not want to see any changes to the harbor channel because it will definitely have a direct impact to the recreational usage of the area.

Mahalo,

Ronald T. Iwami
Friends of Kewalos
President

Cover photo courtesy of Almar Management

H
Historic Evaluation

12644

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

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AQUATIC RESOURCES
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BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

DATE: July 1, 2010

LOG: 2010.2143
DOC: 1007RS05

TO: Anthony J. H. Ching
Executive Director
Hawaii Community Development Authority
461 Cooke Street
Honolulu, HI 96813

SUBJECT: **Section 106 (NHPA) Consultation / Kewalo Basin Repairs**
Permit # (None)
Building Owner: Hawaii Community Development Authority, State of Hawaii
Location: Kewalo Basin, Kona, Oahu
Tax Map Key: (1) 2-1-058:Various

This letter is in response to a report entitled *Historic Evaluation of Kewalo Basin for the Kewalo Basin Repairs Project* written by Mason Architects, Inc. This report was sent with a cover letter from the Hawaii Community Development Authority, dated May 21, 2010, and received by our office on June 1, 2010. The report determines that the Honolulu Marine, Inc. shipyard (boat repair area), formerly occupied by the Hawaiian Tuna Packers, Ltd. shipyard, is the only portion of Kewalo Basin containing structures eligible for the National Register of Historic Places under Criteria A (Events) for its role in the commercial fishing industry and Hawaiian Tuna Packers. This facility includes the wharf, marine railway, shipyard, and shop. All other structures within Kewalo Basin are deemed either less than 50 years of age or so altered as to be ineligible.

The report goes on to discuss proposed construction of two features adjacent to the shipyard.

(1) A floating maintenance dock along the length of the shipyard pile and deck wharf. The float would be installed independent of the wharf, held in place by mooring piles, and accessible from the wharf by means of a ramp system bolted to the end of the wharf deck.

(2) A fixed dock would be placed on the mauka side of the marine railway/haul-out facility, which would again be independent of the existing wharf, and use a transition plate to bridge the gap between the wharf and dock.

The area of potential effect for the above dock installation would be Kewalo Basin and those areas of Kakaako immediately makai and Ewa of the Basin.

We note that both modifications are minimal, removable, and in keeping with the historic function of the shipyard area. **We concur that the project will have no adverse effect on historic property.**

Any questions should be addressed to Ross W. Stephenson, SHPD Historian, at (808) 692-8028 or ross.w.stephenson@hawaii.gov.

Mahalo for the opportunity to comment.

Pua Aiu, Administrator, Hawaii Historic Preservation Division (SHPD)

7/2/10
Date

HAWAII COMMUNITY DEVELOPMENT AUTHORITY

KAKAAKO
KALAELOA

Linda Lingle
Governor

C. Scott Bradley
Chairperson

Anthony J. H. Ching
Executive Director

461 Cooke Street
Honolulu, Hawaii
96813

Telephone
(808) 594-0300

Facsimile
(808) 594-0299

E-Mail
[illegible]cdaweb.org

Web site
www.hcdaweb.org

Ref. No.: ENGR 212.1

May 21, 2010

Ms. Nancy A. McMahon
Deputy State Historic Preservation Officer
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
Kakuhihewa Building
601 Kamokila Boulevard, Suite 555
Kapolei, Hawaii 96707

Dear Ms. McMahon:

Re: Historic Evaluation of Kewalo Basin for the Kewalo Basin Repairs Project

The Hawaii Community Development Authority ("HCDA") is proposing to do repairs and improvements to the deteriorated facilities at Kewalo Basin. Please reference the Environmental Impact Statement Preparation Notice, sent on CD-ROM to the State Historic Preservation Division on April 6, 2010. As part of the project, we have hired the consulting firm of Moffatt & Nichol who, in turn, has hired Helbert, Hastert & Fee Planners, Inc. ("HHF"). HHF has enlisted the services of Mason Architects to prepare a Historic Evaluation of Kewalo Basin for the Kewalo Basin Repairs Project (attached). Also attached, is a letter from Mason Architects to HHF summarizing their findings. In summary, the report finds, "the proposed project has no adverse effect on historic properties." The HCDA therefore, respectfully requests your concurrence with the finding.

Should you have any questions and/or require additional information, please contact Neal Imada at 594-0316 or neal@hcdaweb.org.

Sincerely,

Anthony J. H. Ching
Executive Director

CONCURRED:

State Historic Preservation Division

By______________________________
Its

Date____________________________

AJHC/NII:ak
Encs.
c: Mr. Victor Szabo, Moffatt & Nichol

ARCHITECTURE
RESTORATION
RENOVATION
RESEARCH

Mason Architects

May 11, 2010

Gail Renard
Helber Hastert & Fee
733 Bishop Street, Suite 2590
Honolulu, HI, 96813

Dear Gail,

Please find attached our *Historic Evaluation of Kewalo Basin for the Kewalo Basin Repairs Project*.

We identified one area at Kewalo Basin that is over 50 years of age, exhibits historic significance, and retains sufficient integrity for inclusion in the National Register of Historic Places (NRHP): The Honolulu Marine, Inc. shipyard (boat repair) area, formerly the Hawaiian Tuna Packers, Ltd.'s shipyard. This site, which includes the wharf, marine railway, shipyard, and shop, is eligible under NR criterion "A" for its role in the commercial fishing industry as a shipyard for Hawaiian Tuna Packers, Ltd.

The remaining properties evaluated, which include the Loading Dock at Fisherman's Wharf, the Mauka Wharf/Front Row (and accompanying catwalks and Pier D Herringbone Pier), Diamond Head/Waikiki Wharf (and Piers A, B, and C), and the Makai Wharf (and catwalks), are either less than 50 years of age, or have undergone extensive repairs and modifications. Because of this, they do not retain sufficient integrity, or exhibit sufficient historic fabric, to convey their significance. For example, Pier D (Herringbone Pier) was built in 1961 and the catwalk slips at the Mauka bulkhead were built from 1957 to 1968. Makai wharf catwalk slips were built between 1957 and 1985. Piers A, B, and C are less than fifty years of age (they were built in 1985), and do not meet the exceptional importance requirement of Criterion Consideration G.

We understand from the documents prepared by Moffat & Nichol (enclosed) that the Honolulu Marine, Inc. shipyard (boat repair) area, which we have evaluated as eligible for the NRHP, will be modified only very minimally as part of future basin renovations, as follows.

The work would include the construction of a floating maintenance dock along the length of the shipyard pile and deck wharf. The float is installed independent of the wharf, held in place by mooring piles which are typically installed at the ends. The float would be accessed from the wharf by means of a ramp system that is bolted to the end of the wharf deck, and rolls back and forth on the top of the float due to tide level changes and waves in the harbor. Utility services including potable water and electricity would need to be provided for the floats, but it is likely these already exist in this location since the existing facility accommodates tug boats.

Additional work in the area of the Honolulu Marine, Inc. shipyard (boat repair) area includes the construction of a fixed dock on the mauka side of the marine railway/haul-out facility. This fixed dock/pier would be installed independent of the existing wharf, with enough of a separation that the anticipated movements of the new pier would not impact the existing wharf. A steel transition plate (that is bolted to one of the structures – and is permitted to move on the other) bridges the gap between the structures. Utility services including potable water and electricity would need to be provided for the new pier.

The work shown on the enclosed schematic design with the text “Dock Perpendicular to Pier Head” at Fisherman’s Wharf Loading Dock is not part of the historic Honolulu Marine, Inc. shipyard (boat repair) area.

The modifications described above are minimal, removable, and in keeping with the historic use and function of the Honolulu Marine, Inc. shipyard (boat repair) area. Because of this, we believe that the proposed project has no adverse effect on historic properties.

Please let me know if you have any questions.

Sincerely,

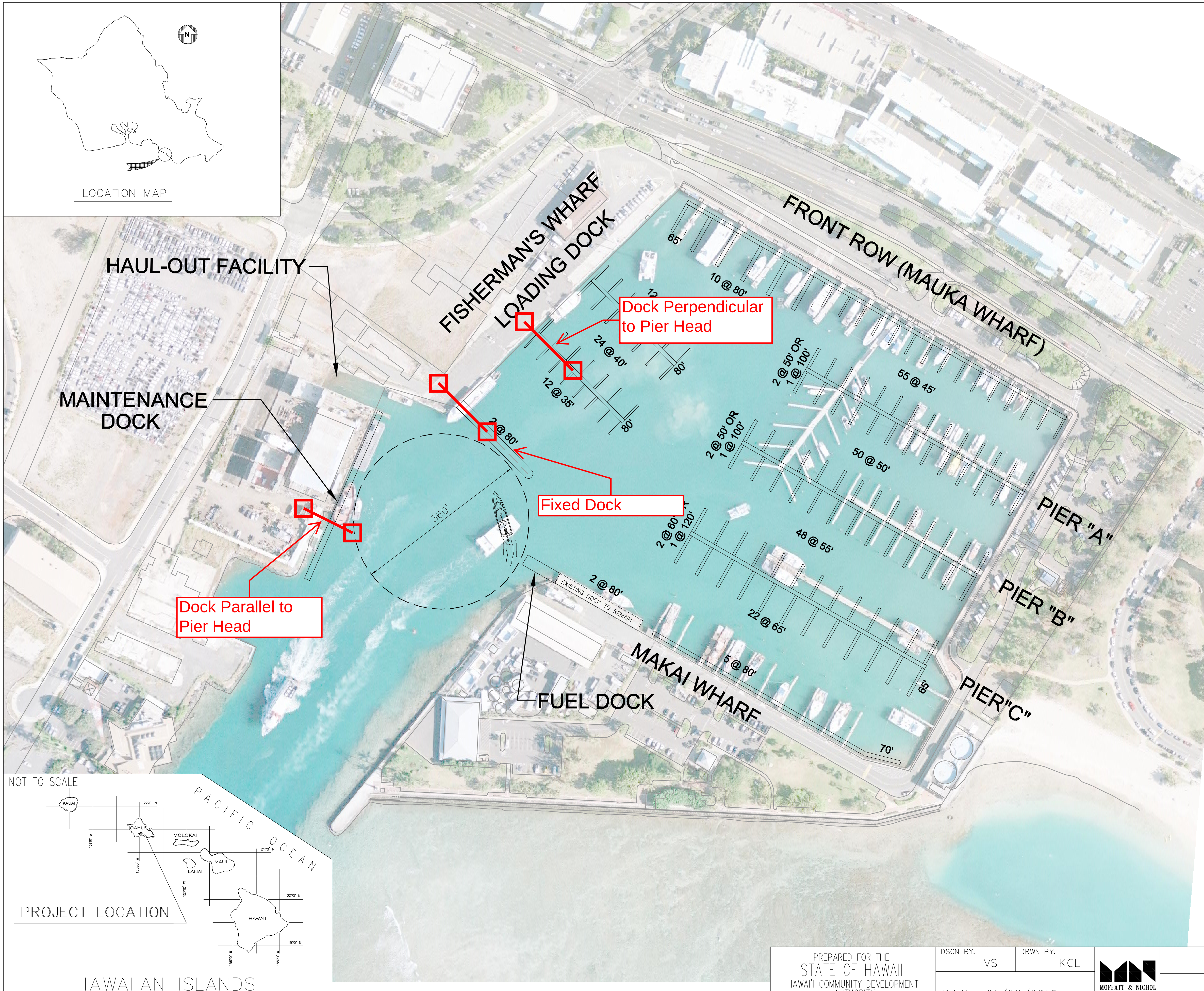
Polly Cosson Tice

Enclosures *Historic Evaluation of Kewalo Basin for the Kewalo Basin Repairs Project*
Kewalo Basin Alternative A Schematic Layout
Narrative Description of proposed work

The narrative description below, of how the new piers will be attached to Fisherman's Wharf and Honolulu Marine bulkheads, was written by Moffat & Nichol. This text is excerpted from an email dated May 7, 2010 from Gail Renard (HHF) to Polly Tice (MAI).

M&N: The Alternative A layout presents three different docking arrangements on the Ewa side of the basin.(see attached Schematic Layout)

1. *The first is the installation of floating piers extending perpendicularly from the Fisherman's Wharf Dock. The floats are installed independent of the existing shore (or in our case, the pile and deck wharf). The floats are held in place by mooring piles, typically installed at the ends of the individual fingers, and also along the main walkway or "spine". The floats are accessed from the shore by means of a ramp system that is bolted to the edge of the wharf deck, and rolls back and forth on the top of the float due to tide level changes and waves in the harbor. Utilities services such as potable water and electricity, would need to be provided for the new floats. The services would extend from the nearest existing connection point to the new floats, and they would be installed under the deck and likely supported by metal hangers drilled into the concrete structure.*
2. *The second is the installation of floating piers extending parallel to the Honolulu Marine Dock. As with 1) above, the float is installed independent of the existing dock. The float is held in place by mooring piles, typically installed along the inshore side of the float. This type of longitudinal dock does not have individual finger piers. The float is accessed from the shore by means of a ramp system that is bolted to the edge of the wharf deck, and rolls back and forth on the top of the float due to tide level changes and waves in the harbor. Utilities services including potable water and electricity, would need to be provided for the new floats. It is likely that these services already exist close to the waterside of the dock since the existing facility accommodates tug boats.*
3. *The third is the installation of a fixed pier extending perpendicularly from the makai end of Fisherman's Wharf Dock. The structure would be installed independent of the existing wharf, with enough of a separation that the anticipated movements of the new pier would not impact the existing wharf. A steel transition plate that is bolted to one of the structures and is permitted to move on the other bridges the gap between the structures. Utilities services including potable water and electricity, would need to be provided for the new pier. The services would extend from the nearest existing connection point to the new floats, and they would be installed under the deck and likely supported by metal hangers drilled into the concrete structure.*



DESCRIPTION:

REMOVE EXISTING HERRINGBONE AND REPLACE / REPAIR EXISTING PIERS WITH EITHER FIXED PIERS OR FLOATING DOCKS, AND REPLACE PILING AS NECESSARY.

SLIP MIX

SLIP LENGTH	EXISITING	PROPOSED
35'	0	12
40'	14	36
44'	1	0
45'	0	55
50'	39	50
54'	2	0
55'	0	48
60'	14	0
64'	1	0
65'	0	24
66'	10	0
68'	2	0
70'	26	1
80'	18	21
90'	5	0
100'	11	2
120'	0	1
TOTAL	143	250

PROPOSED CLEAR SPACE

SLIP LENGTH	SLIP WIDTH
35'	29'
40'	32'
45'	36'
50'	37'
55'	40'
60'	42'
65'	44'
80'	52'
100'	66'

N

0' 100' 200' 300'
1"=200'

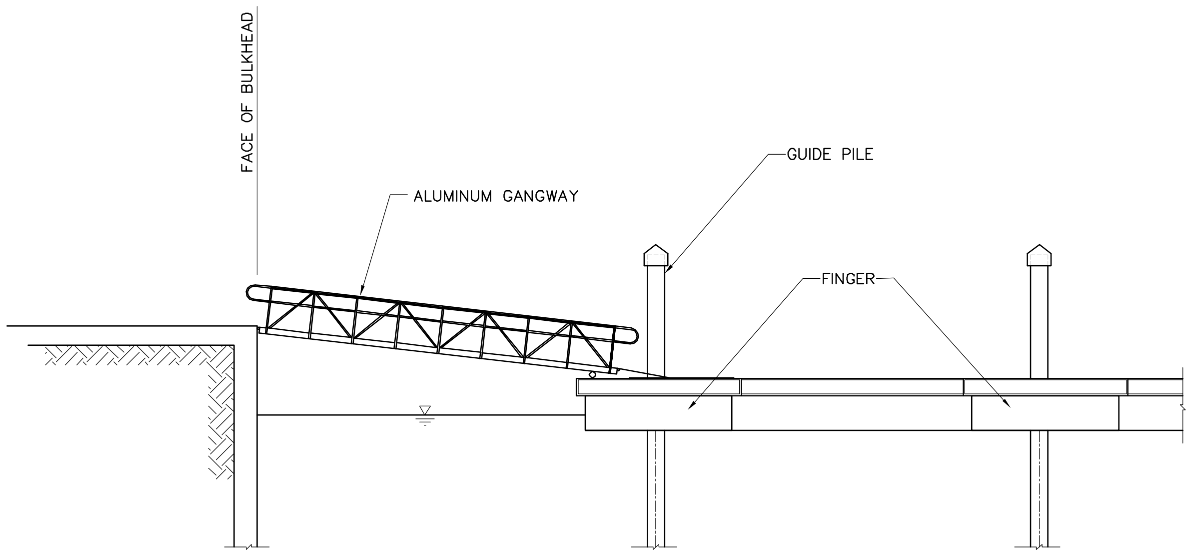
PREPARED FOR THE
STATE OF HAWAII
HAWAI'I COMMUNITY DEVELOPMENT AUTHORITY

DSGN BY: VS
DRWN BY: KCL
DATE: 01/28/2010

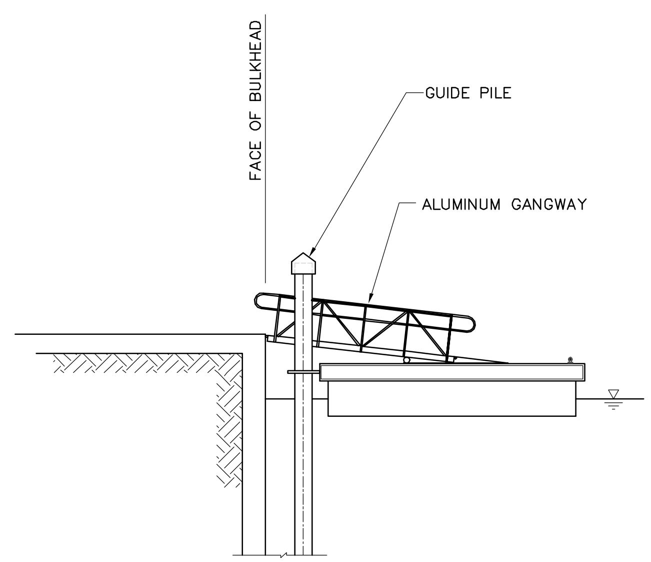
MOFFATT & NICHOL

KEWALO BASIN
ALTERNATIVE A

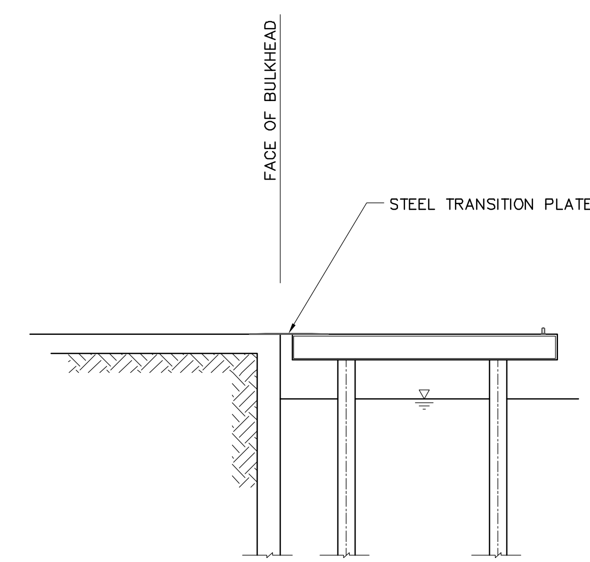
SHEET X OF X



DOCK PERPENDICULAR TO PIER HEAD



DOCK PARALLEL TO PIER HEAD



FIXED DOCK

PREPARED FOR THE STATE OF HAWAII HAWAI'I COMMUNITY DEVELOPMENT AUTHORITY	DSGN BY: VS	DRWN BY: KCL	MOFFATT & NICHOL	DOCK CROSS SECTIONS	SHEET 1	OF
	DATE: 5/4/10					

HISTORIC EVALUATION OF KEWALO BASIN

for the

KEWALO BASIN REPAIRS PROJECT

Mason Architects, Inc.

Prepared for Helber Hastert & Fee, Planners

May, 2010

Table of Contents

List of Figures

1.0 Introduction

1.1 Scope of Work

Mason Architects, Inc. (MAI) was contracted to undertake research of the waterfront facilities at Kewalo Basin in order to determine whether any historic properties would be affected by proposed harbor improvements under the *Kewalo Basin Repairs Project*. The facilities that were evaluated include: the Honolulu Marine Shipyard (Boat Repair) Area, the Loading Dock at Fisherman's Wharf, the Mauka Wharf/Front Row (and accompanying catwalks and Pier D, Herringbone Pier), Diamond Head/Waikiki Wharf (and Piers A, B, and C), and the Makai Wharf (and associated catwalks). Of these facilities, one area was identified as historic: the Honolulu Marine, Inc.'s shipyard (boat repair) area.

See Figure 1 for a map of the facilities evaluated.

1.2 Methodology

The methodology employed by MAI in evaluating the waterfront facilities at Kewalo Basin for historic significance is as follows. Field work took place at Kewalo Basin in February of 2010, which included detailed photographic documentation. Historic research followed, which included obtaining historic construction drawings, historic photographs, and pertinent articles. Using the National Parks Service's National Register Bulletin No.15, *How to Apply the National Register Criteria for Evaluation*, MAI evaluated the waterfront properties for historic significance and integrity.

1.3 Project Team

Field work and research took place at Kewalo Basin in February of 2010, performed by Architectural Historian Monica Bacon. The evaluation of properties, and the preparation of this report, were overseen by Architectural Historian and Project Manager Polly Cosson Tice.

2.0 National Register of Historic Places Significance Criteria

For a property to qualify as eligible for the National Register of Historic Places (NRHP) it must meet at least one of the four NRHP criteria for evaluation. The four NRHP criteria are for properties:

A. that are **associated with events** that have made a significant contribution to the broad patterns of our history; or

B. that are **associated with the lives of persons** significant in our past; or

C. that **embody the distinctive characteristics** of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. that **have yielded, or may be likely to yield, information** important in prehistory or history.

Ordinarily cemeteries, birthplaces, graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

A. A religious property deriving primary significance from architectural or artistic distinction or historical importance; or

B. A building or structure removed from its original location but which is primarily significant for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or

C. A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his or her productive life; or

D. A cemetery which derives its primary importance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or

E. A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or

F. A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

G. A property achieving significance within the past 50 years if it is of exceptional importance.

For a property to be eligible for the NRHP it must also retain historic integrity. Integrity ensures that the property conveys its significance through its physical features. The NRHP's seven aspects of integrity are location, design, setting, materials, workmanship, feeling, and association.

3.0 Significance Evaluation

After performing field work and research, MAI has evaluated one area at Kewalo Basin which retains sufficient integrity to be eligible for the NRHP. The Honolulu Marine, Inc. shipyard (boat repair) area, formerly the Hawaiian Tuna Packers, Ltd.'s shipyard. This site, which includes the wharf, marine railway, shipyard, and shop, is eligible under NR criterion "A" for its historic role in the commercial fishing industry as a shipyard for Hawaiian Tuna Packers, Ltd. (Note: the shipyard and shop building were not evaluated in detail, but are mentioned here since they are an integral component of this waterfront area.) See Figure 1 for the location of this site.

The remaining properties evaluated, which include the Loading Dock at Fisherman's Wharf, the Mauka Wharf/Front Row (and accompanying catwalks and Pier D Herringbone Pier), Diamond Head/Waikiki Wharf (and Piers A, B, and C), and the Makai Wharf (and catwalks), are either less than 50 years of age, or have undergone extensive repairs and modifications. Because of this, they do not retain sufficient integrity, or exhibit sufficient historic fabric, to convey their significance. For example, Pier D (Herringbone Pier) was built in 1961 and the catwalk slips at the Mauka bulkhead were built from 1957 to 1968. Makai wharf catwalk slips were built between 1957 and 1985. Piers A, B, and C are less than fifty years of age (they were built in 1985), and do not meet the exceptional importance requirement of Criterion Consideration G.

Kewalo Basin has also received other modifications over time. For example, the entire Makai section of the basin was a reef that was in-filled in 1955. The beach connection/adjoining waterway between Kewalo Basin and Ala Moana Beach Park was severed in 1955 when the area was in-filled to form a peninsula. Additionally, the narrow drainage canal from the Ala Moana Beach Park to the Kewalo Basin area was channelized below grade sometime between 1949 and 1953. Because of these modifications, much of Kewalo Basin has lost historic integrity.

4.0 References

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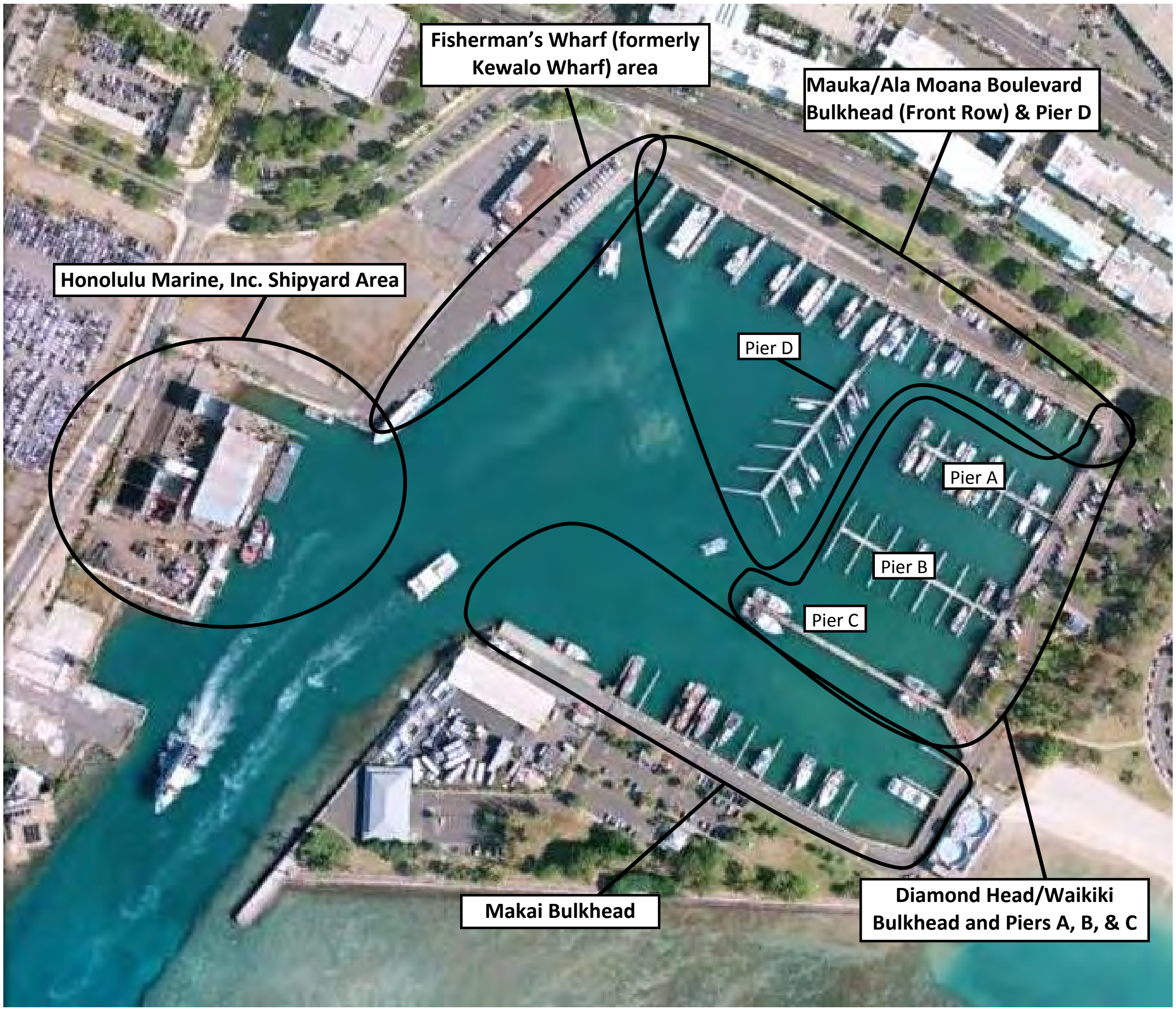

Figure 1. Aerial view of Kewalo Basin Repairs Project Area.

Figure 2. Aerial view of Honolulu Marine, Inc. shipyard area (former Hawaiian Tuna Packers, Ltd.'s shipyard).

Figure 3. View facing north showing wharf and waterfront area at Honolulu Marine, Inc. shipyard (*Source: MAI, February 2010*).

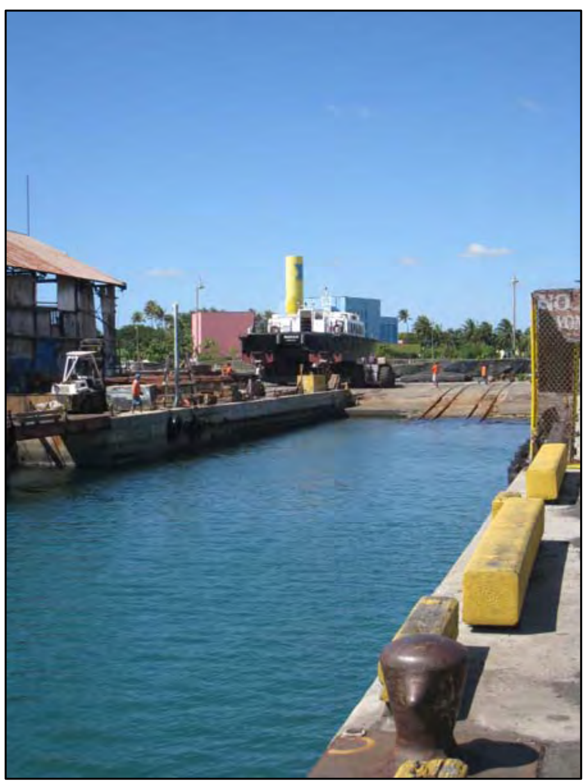

Figure 4. View facing west showing marine railway (*Source: MAI, February 2010*).

Figure 5. View facing south showing wharf and waterfront area at Honolulu Marine, Inc. shipyard (*Source: Honolulu Advertiser, 9/24/2007 article; undated photo)*.

Figure 6. Present day view facing south showing wharf and waterfront area at Honolulu Marine, Inc. shipyard (*Source: MAI, February 2010)*.