Ecosystems and Natural Resources Technical Report
Honolulu High-Capacity Transit Corridor Project

August 15, 2008

Prepared for:
City and County of Honolulu

Preface

This technical report supports the Draft Environmental Impact Statement (EIS) prepared for the Honolulu High-Capacity Transit Corridor Project. It provides additional detail and information as it relates to:

- Methodology used for the analysis
- Applicable regulations
- Results of the technical analysis
- Proposed mitigation
- Coordination and consultation (as appropriate)
- References
- Model output (as appropriate)
- Other information/data

As described in the Draft EIS, the Locally Preferred Alternative, called the "Full Project," is an approximate 30-mile corridor from Kapolei to the University of Hawai‘i at Mānoa with a connection to Waikīkī. However, currently available funding sources are not sufficient to fund the Full Project. Therefore, the focus of the Draft EIS is on the "First Project," a fundable approximately 20-mile section between East Kapolei and Ala Moana Center. The First Project is identified as "the Project" for the purpose of the Draft EIS.

This technical report documents the detailed analysis completed for the Full Project, which includes the planned extensions, related transit stations, and construction phasing. The planned extensions and related construction planning have not been fully evaluated in the Draft EIS and are qualitatively discussed in the Cumulative Effects section of the Draft EIS as a foreseeable future project(s). Once funding is identified for these extensions, a full environmental evaluation will be completed in a separate environmental study (or studies), as appropriate.

Figure 1-3 through Figure 1-6 (in Chapter 1, Background) show the proposed Build Alternatives and transit stations, including the areas designated as planned extensions.

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Acronyms and Abbreviations

AFS	American Fisheries Society
CRM	Concrete-rubble masonry
CWA	Clean Water Act
DA	Department of the Army
DLNR-DAR	Department of Land and Natural Resources Division of Aquatic Resources
DLNR-DOFAW	Department of Land and Natural Resources Division of Forestry and Wildlife
DTS	Department of Transportation Services
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
‘Ewa (direction)	toward the west
FTA	Federal Transit Administration
H-1	Interstate Route H-1 (the H-1 Freeway)
HBMP	Hawai‘i Biodiversity and Mapping Program
HCP	Habitat Conservation Plan
HDOH	Hawai‘i State Department of Health
HDOT	Hawai‘i State Department of Transportation
HECO	Hawaiian Electric Company
HRS	Hawai‘i Revised Statutes
ITL	Incidental Take License
Koko Head (direction)	toward the east
makai (direction)	toward the sea
mauka (direction)	toward the mountains
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act

NOAA/FS	National Oceanic and Atmospheric Administration/National Marine Fisheries Service
NRCS	National Resource Conservation Service
NWR	National Wildlife Refuge
O‘ahuMPO	O‘ahu Metropolitan Planning Organization
RHA	Rivers and Harbors Act
RTD	City and County of Honolulu Department of Transportation Services Rapid Transit Division
SE	Standard Error
TPSS	traction power substation
UH	University of Hawai‘i
USACE	U.S. Army Corps of Engineers
EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
Wai‘anae (direction)	toward the west (see also ‘Ewa)

Summary

The City and County of Honolulu Department of Transportation Services Rapid Transit Division (RTD), in cooperation with the U.S. Department of Transportation Federal Transit Administration (FTA), is preparing this Draft Environmental Impact Statement (EIS) to evaluate alternatives that would provide high-capacity transit service on the Island of O‘ahu. The study area is the travel corridor between Kapolei and the University of Hawai‘i at Mānoa (UH Mānoa), a distance of approximately 23 miles along the southern coastal plain of the Island.

An assessment of the study area’s wildlife, vegetation, and wetland resources was made through the review of existing studies, consultation with resource agencies, and field surveys. Emphasis was placed on the potential presence of Federal and/or State-protected species and any sensitive habitats. The study and analysis indicates that the Honolulu High-Capacity Transit Corridor Project (Project) would have no effect on any threatened, endangered, or protected species. The study area’s present environment has been altered over the past century to accommodate roadways and agricultural, commercial, industrial, military, and residential development. Remnants of wetland resources associated with natural springs are present, albeit minimally; and streams have been channelized for flood management and roadway and bridge construction.

Vegetation

Vegetation primarily consists of introduced species and landscape ornamentals along roadways. Within the less developed ‘Ewa section of the study corridor, a wider variety of vegetation is present. In the ‘Ewa area, introduced species that thrive in a relatively dry climate are dominant, but this less developed area also provides habitat for a number of native and federally listed plant species.

One threatened species, ko‘oloa‘ula or red ‘ilima *(Abutilon menziesii*) is prevalent on vacant land in the vicinity of the East Kapolei Station and North-South Road. This extant population has been well documented in a Habitat Conservation Plan (HCP) since its discovery in 1996. Although plants have been observed in the area in the past, no plants were observed during field studies performed along the proposed fixed guideway alignment.

The HCP for *Abutilon menziesii* at Kapolei (Ohashi 2004) was approved and is managed by the State Department of Land and Natural Resources-Division of Forestry and Wildlife (DLNR-DOFAW) in collaboration with the U.S. Fish and Wildlife Service (USFWS). The HCP included the establishment of an on-site 18-acre contingency reserve for *Abutilon menziesii*. The HCP process involved a formal biological assessment and opinion of no jeopardy for the species, based on the fulfillment of mitigation measures outlined in the HCP. A State Incidental Take License (ITL-05) was issued in March 2005 to the Hawai‘i State Department of Transportation (HDOT) for the North-South Road Project.

The ITL allows the removal of *Abutilon menziesii* plants within the surrounding land area, with the exception of plants within the 18-acre contingency reserve. The reserve will remain in place until off-site mitigation measures are fulfilled over the 20-year duration of the HCP. The Project would require a Certificate of Inclusion to the ITL from HDOT.

Project components that may directly affect *Abutilon menziesii* include a 12-acre park-and-ride lot, the East Kapolei Station, and the fixed guideway, which are situated less than 200-feet from the 18-acre contingency reserve.

Continuing consultation with DLNR will be necessary, and the construction impact area will need to be resurveyed prior to construction. If any *Abutilon menziesii* plants are found, a DLNR horticulturist would remove the plants and transplant them to the contingency reserve. All applicable protective measures of the HCP would apply to construction practices, including the installation of construction fencing, implementation of fire control measures, and establishment of appropriate buffers for fire control.

Wildlife

The wildlife survey found birds that are common to the dry lowlands and urban environments of O‘ahu. The most abundant species were the introduced zebra dove (*Geopelia striata*), common myna (*Acridotheres tristis*), spotted dove (*Streptopelia chinensis*), English sparrow (*Paser domesticus*), red-vented bulbul (*Pycnonotus cafer*), and the rock dove (*Columba livia*). Common mynas were most frequently observed, present at 42 out of 48 count stations, but had a lower overall number of sightings than zebra doves, which appeared in 40 out of 48 count stations. Black francolin (*Francolinus francolinus*) and gray francolin (*Francolinus pondicerianus*) were present in farmland and dry lowland shrublands along the North-South Road corridor in the ‘Ewa District.

Several federally protected migratory shorebirds were present at the Sumida Watercress Farm (Kalauao Spring) in Waimalu. The migratory wandering tattler, (*Tringa incana*, formerly *Heteroscelus incanus*), ruddy turnstone (*Arenaria interpres*), Pacific golden plover (*Pluvialis dominica*), and the introduced cattle egret (*Bulbulcus ibis*) were found foraging in this watercress farm during the survey.

Waterbirds, including the federally listed endangered Hawaiian stilt (*Himantopus mexicanus*), are present along the alignment and inhabit the Waiau and Kalauao (Sumida Watercress Farm) springs that are located on the mauka-side of the alignment. Although not observed during surveys along the alignment, the federally listed endangered common moorhen has been recorded at the Sumida Watercress Farm (HBMP 2006).

The native black-crowned night heron (*Nycticorax nycticorax*), another federally protected migratory bird, was present at Moanalua Stream, Kalauao Spring, and near the Honolulu International Airport over a drainage canal along Aolele Street near Ke‘ehi Lagoon, where mangroves support a cattle egret (*Bulbulcus ibis*)/heron roost.

White terns, or common fairy terns (*Gygis alba*), are a State of Hawai‘i-listed threatened species. They appeared at 4 of the 48 count stations and were entirely within the portion of the study corridor between Middle Street and the UH Mānoa/Waikīkī area, where large trees are present along the streets and within Kapi‘olani Park.

Construction activities adjacent to the springs and other water bodies where waterbirds were observed may temporarily affect the feeding habits of the Hawaiian stilt and other waterbirds. However, over the long term these birds are expected to adapt to the new elevated guideway structure and the presence of trains, as they have adapted to the presence of highway traffic.

Although some mature trees favored by white terns would be pruned or removed for the Project, other mature trees would remain nearby as nesting and roosting habitat. Surveys for nesting white terns would be conducted prior to tree pruning, and would be postponed until eggs have hatched and chicks have fledged.

Wetlands and Streams

Both the Waiau and Kalauao springs are valued wetlands for their fresh water, water storage, wildlife habitat functions, and unique agricultural value, and are protected by Section 404 of the Clean Water Act. No direct impact to either of the springs and associated wetlands are anticipated.

Along the 23-mile study corridor, the proposed alignment would cross numerous streams. At locations where the alignment would cross streams, stream channels have been altered for storm drainage management and roadway or bridge construction, and water quality is generally degraded. Streams that are less than 150 feet wide would be spanned by the fixed guideway. However, supporting piers (or columns) may be placed within streams with widths greater than 150 feet. Federal and State permits will be required for dredge or fill within streams, including the placement of in-water columns, in compliance with Department of the Army U.S. Army Corps of Engineers Section 404, Clean Water Act and/or Section 10, Rivers and Harbors Act (RHA) and State water quality and coastal zone permits.

Comprehensive biological surveys of Pearl Harbor’s freshwater springs, wetlands, and estuarine areas revealed an ecologically degraded fauna dominated by introduced species. The lower portions of Pearl Harbor’s streams, springs, and wetlands are now dominated, both in total biomass and total numbers, by introduced species (Englund 2000a). The endemic ‘o‘opu nakea (*Awaous guamensis*) was uncommon but present in Waikele and Waimalu Streams. ‘O‘opu nakea is listed as a Species of Special Concern by the American Fisheries Society (AFS) (*http://hbs.bishopmuseum.org/good-bad/oopu-full.html*). Pū‘ōhala Marsh, located between Waikele and Kapakahi Streams in Waipahu, is a 70-acre coastal wetland that has been identified as of critical importance to Hawaii’s endangered waterbirds (Englund 2000a).

The lower stream reaches and estuaries of the south shore of O‘ahu represent some of the most disturbed aquatic and estuarine habitats found in the Hawaiian Islands. One of the major survey findings in this area was a direct correlation of native species predominating as the environment became more marine in character (Englund 2000b). The survey also found that many native aquatic species have been displaced in the lower reaches of freshwater systems along the south shore of O‘ahu. The loss of a major group of native aquatic insects such as the Megalagrion damselflies and native aquatic saldids, the near absence of freshwater mollusks, the scarcity of native fish such the *‘o‘*opu nakea, and the absence or near absence of the *‘o‘*opu alamoo (*Lentipes concolor*) and *‘o‘*opu nopili (*Sicyopterus stimpsoni*) in the lower stream reaches are evidence of this decline (Englund 2000b).

Although water quality is generally degraded, perennial streams may serve as nurseries for some marine fishes. Bridge support piers that are 6 to 10 feet in diameter would not inhibit *‘o‘*opu from traversing to the ocean during the twice-a-year spawning period. The U.S. Army Corps of Engineers process would require formal consultation with the USFWS and the National Oceanic and Atmospheric Administration/National Marine Fisheries Service and may require a Biological Assessment for the ‘o‘opu. Potential streams that may require Department of the Army permits include Hālawa Stream, Moanalua Stream, and Ala Wai Canal.

1 Background

1.1 Introduction

The City and County of Honolulu Department of Transportation Services Rapid Transit Division (RTD), in cooperation with the U.S. Department of Transportation Federal Transit Administration (FTA), is evaluating fixed-guideway alternatives that would provide high-capacity transit service on O‘ahu. The project study area is the travel corridor between Kapolei and the University of Hawai‘i at Mānoa (UH Mānoa) (Figure 1-1). This corridor includes the majority of housing and employment on O‘ahu. The east-west length of the corridor is approximately 23 miles. The north-south width is, at most, 4 miles because the Ko‘olau and Wai‘anae Mountain Ranges bound much of the corridor to the north and the Pacific Ocean to the south.

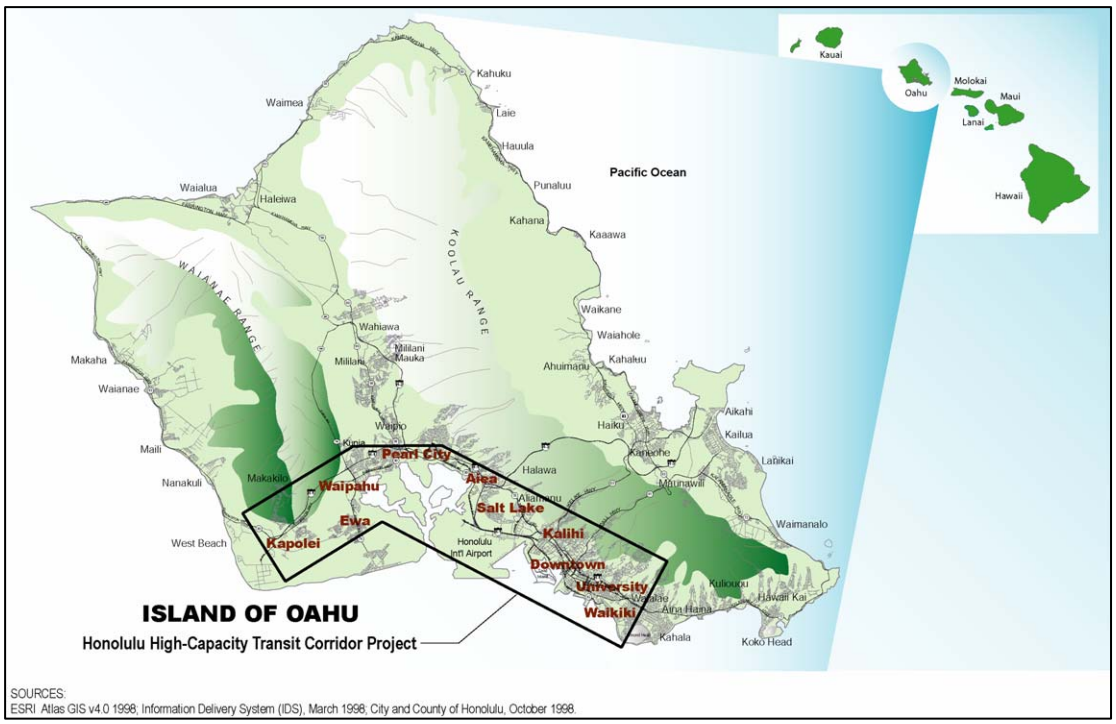

Figure 1-1: Project Vicinity

1.2 Description of the Study Corridor

The Honolulu High-Capacity Transit Corridor extends from Kapolei in the west (Wai‘anae or ‘Ewa direction) to UH Mānoa in the east (Koko Head direction) and is confined by the Wai‘anae and Ko‘olau Mountain Ranges in the mauka direction (towards the mountains, generally to the north within the study corridor) and the Pacific Ocean in the makai direction (towards the sea, generally to the south within the study corridor). Between Pearl City and ‘Aiea, the corridor’s width is less than 1 mile between Pearl Harbor and the base of the Ko‘olau Mountains (Figure 1-2).

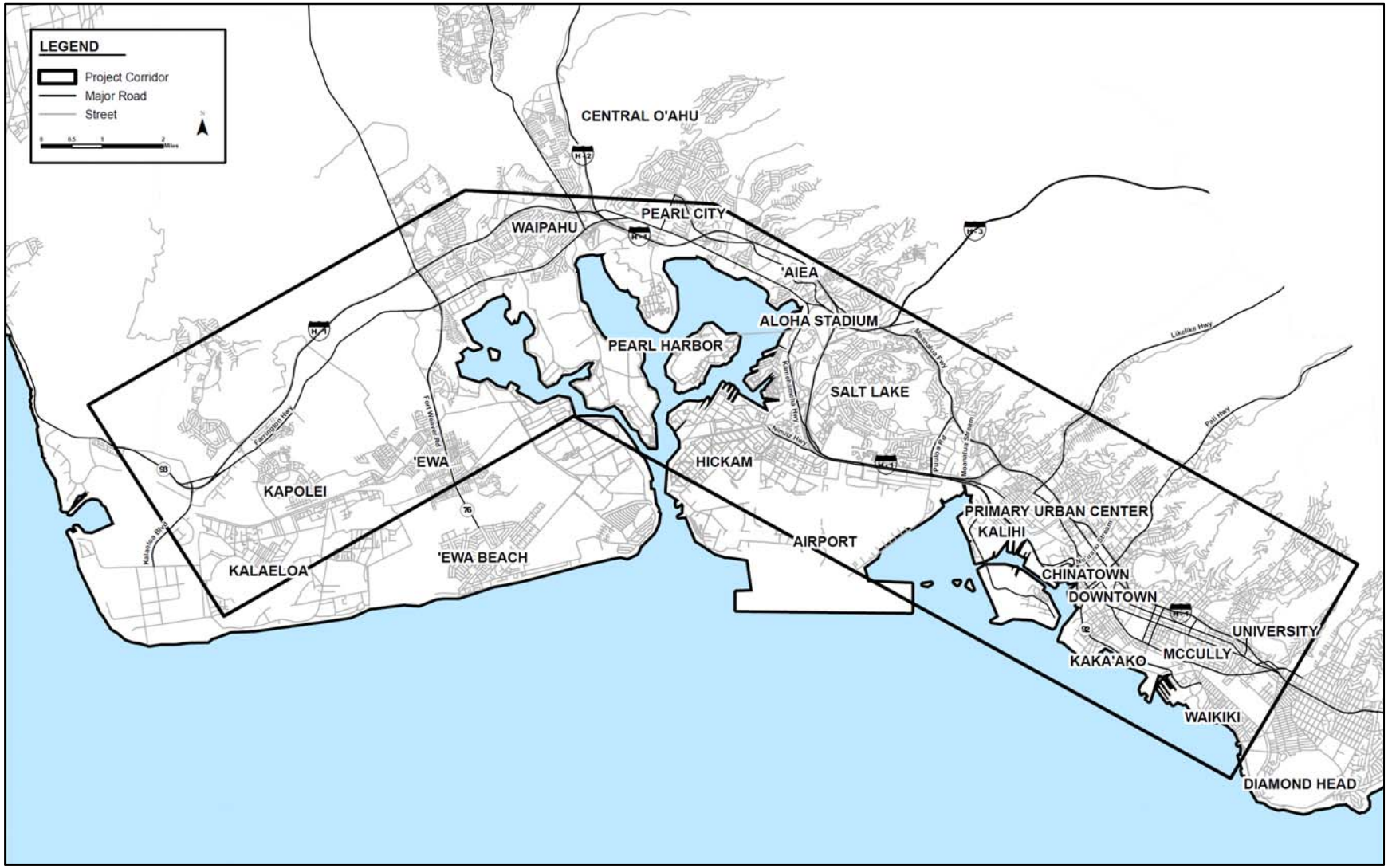

Figure 1-2: Areas and Districts in the Study Corridor

1.3 Alternatives

Four alternatives are being evaluated in the Environmental Impact Statement (EIS). They were developed through a screening process that considered alternatives identified through previous transit studies, a field review of the study corridor, an analysis of current and projected population and employment data for the corridor, a literature review of technology modes, work completed by the Oʻahu Metropolitan Planning Organization (OʻahuMPO) for its *Oʻahu Regional Transportation Plan 2030* (ORTP) (OʻahuMPO 2007), a rigorous Alternatives Analysis process, selection of a Locally Preferred Alternative by the City Council, and public and agency comments received during the separate formal project scoping processes held to satisfy National Environmental Policy Act (NEPA) (USC 1969) requirements and the Hawaiʻi EIS Law (Chapter 343) (HRS 2008). The alternatives evaluated are as follows:

1. No Build Alternative
2. Salt Lake Alternative
3. Airport Alternative
4. Airport & Salt Lake Alternative

1.3.1 No Build Alternative

The No Build Alternative includes existing transit and highway facilities and committed transportation projects anticipated to be operational by 2030. Committed transportation projects are those identified in the ORTP, as amended (OʻahuMPO 2007). Highway elements of the No Build Alternative also are included in the Build Alternatives. The No Build Alternative would include an increase in bus fleet size to accommodate growth, allowing service frequencies to remain the same as today.

1.3.2 Build Alternatives

The fixed guideway alternatives would include the construction and operation of a grade-separated fixed guideway transit system between East Kapolei and Ala Moana Center (Figure 1-3 to Figure 1-6). Planned extensions are anticipated to West Kapolei, UH Mānoa, and Waikīkī. The system evaluated a range of fixed-guideway transit technologies that met performance requirements, which could be either automated or employ drivers. All parts of the system would either be elevated or in exclusive right-of-way.

Steel-wheel-on-steel-rail transit technology has been proposed through a comparative process based on the ability of various transit technologies to cost-effectively meet project requirements. As such, this technology is assumed in this analysis.

The guideway would follow the same alignment for all Build Alternatives through most of the study corridor. The Project would begin by following North-South Road and other future roadways to Farrington Highway. Proposed station locations and

other project features in this area are shown in Figure 1-3. The guideway would follow Farrington Highway Koko Head on an elevated structure and continue along Kamehameha Highway to the vicinity of Aloha Stadium (Figure 1-4).

Between Aloha Stadium and Kalihi, the alignment differs for each of the Build Alternatives, as detailed later in this section (Figure 1-5). Koko Head of Middle Street, the guideway would follow Dillingham Boulevard to the vicinity of Ka‘aahi Street and then turn Koko Head to connect to Nimitz Highway in the vicinity of Iwilei Road.

The alignment would follow Nimitz Highway Koko Head to Halekauwila Street, then along Halekauwila Street past Ward Avenue, where it would transition to Queen Street and Kona Street. Property on the mauka side of Waimanu Street would be acquired to allow the alignment to cross over to Kona Street. The guideway would run above Kona Street through Ala Moana Center.

Planned extensions would connect at both ends of the corridor. At the Wai‘anae end of the corridor, the alignment would follow Kapolei Parkway to Wākea Street and then turn makai to Saratoga Avenue. The guideway would continue on future extensions of Saratoga Avenue and North-South Road. At the Koko Head end of the corridor, the alignment would veer mauka from Ala Moana Center to follow Kapi‘olani Boulevard to University Avenue, where it would again turn mauka to follow University Avenue over the H-1 Freeway to a proposed terminal facility in UH Mānoa’s Lower Campus. A branch line with a transfer point at Ala Moana Center or the Hawai‘i Convention Center into Waikīkī would follow Kalākaua Avenue to Kūhiō Avenue to end near Kapahulu Avenue (Figure 1-6).

Salt Lake Alternative

The Salt Lake Alternative would leave Kamehameha Highway immediately ‘Ewa of Aloha Stadium, cross the Aloha Stadium parking lot, and continue Koko Head along Salt Lake Boulevard (Figure 1-5). It would follow Pūkōloa Street through Māpunapuna before crossing Moanalua Stream, turning makai, crossing the H-1 Freeway and continuing to the Middle Street Transit Center. Stations would be constructed near Aloha Stadium and Ala Liliko‘i. The total guideway length for this alternative would be approximately 19 miles and it would include 19 stations. The eventual guideway length, including planned extensions, for this alternative would be approximately 28 miles and it would include 31 stations.

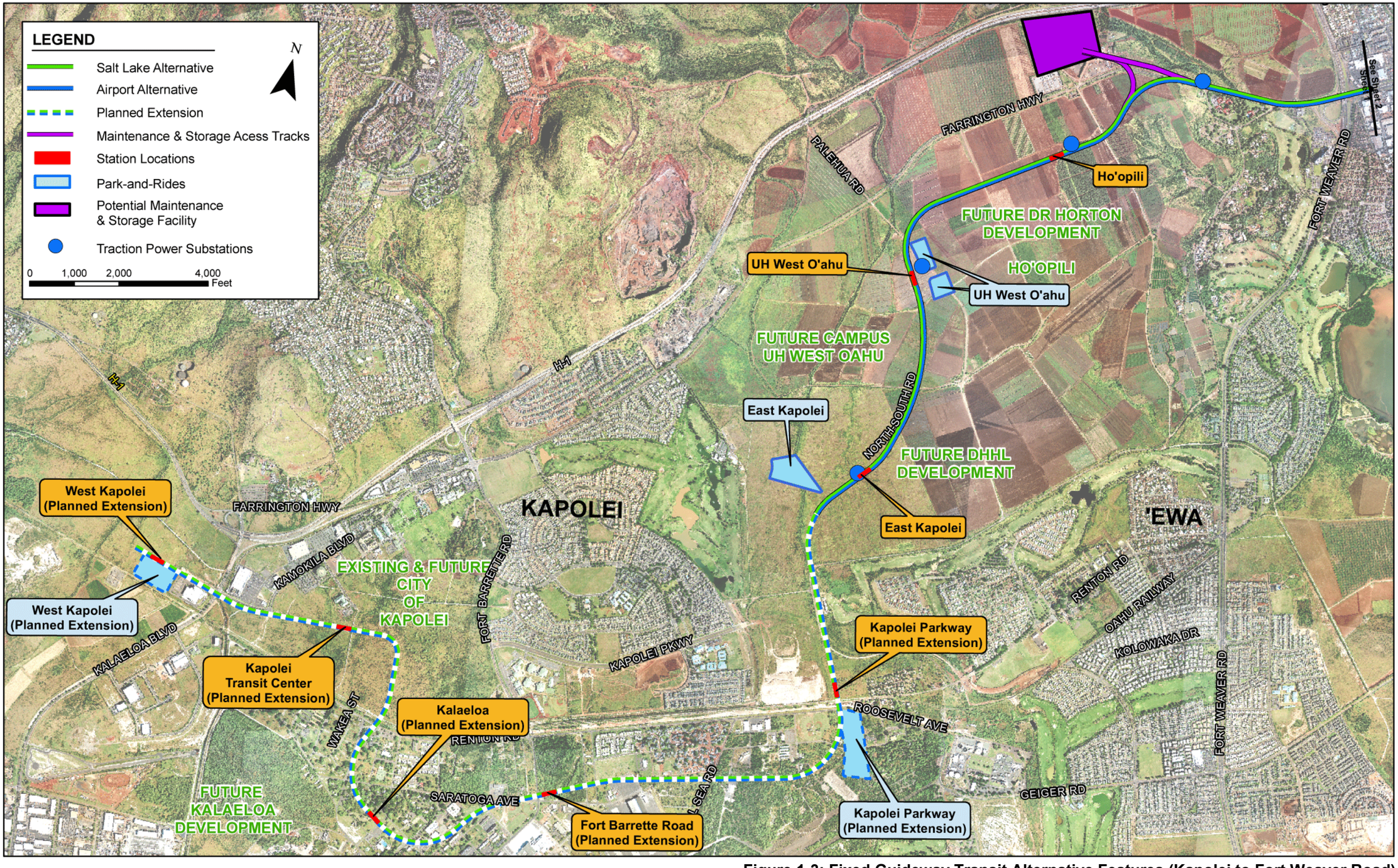

Figure 1-3: Fixed Guideway Transit Alternative Features (Kapolei to Fort Weaver Road)

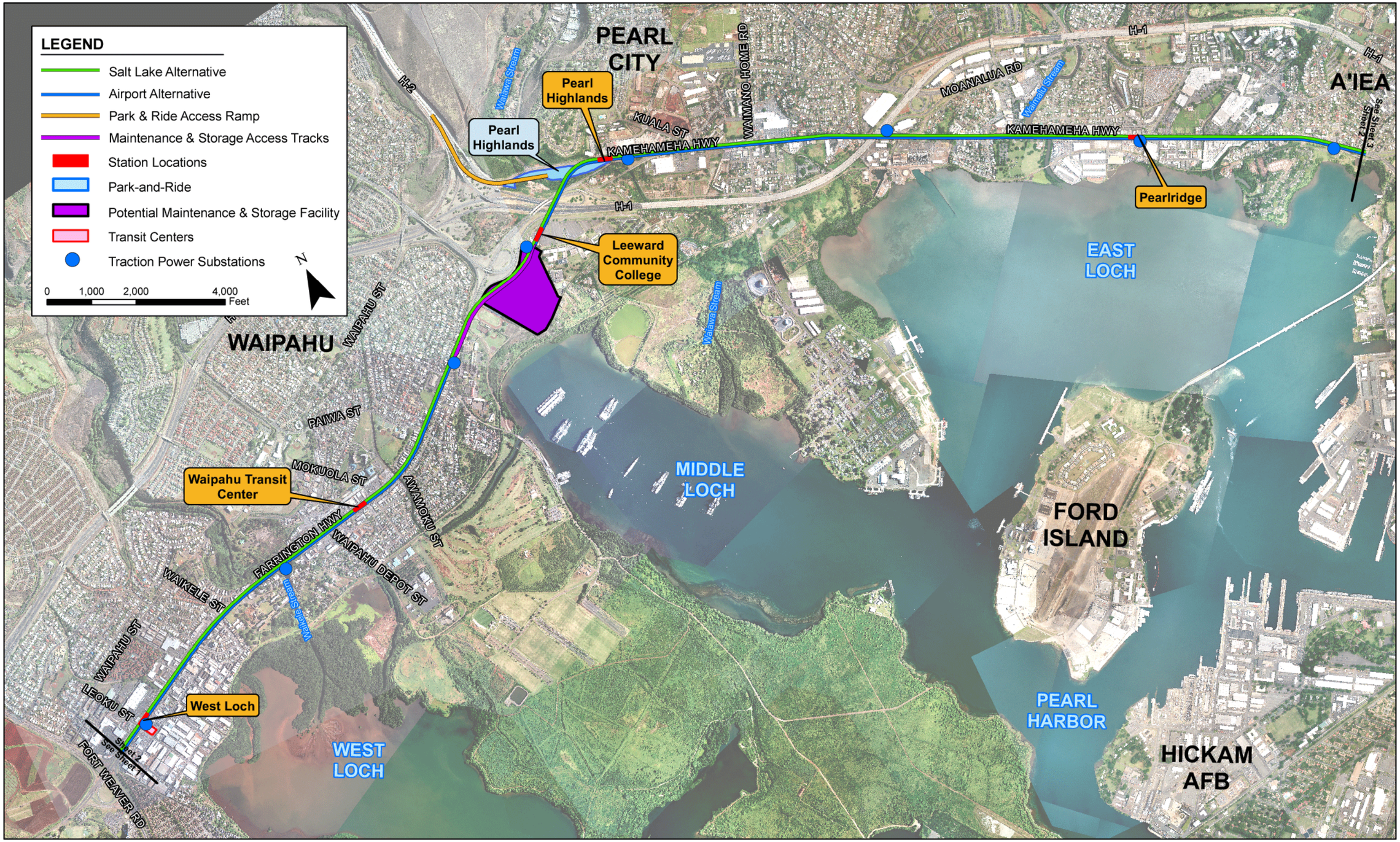

Figure 1-4: Fixed Guideway Transit Alternative Features (Fort Weaver Road to Aloha Stadium)

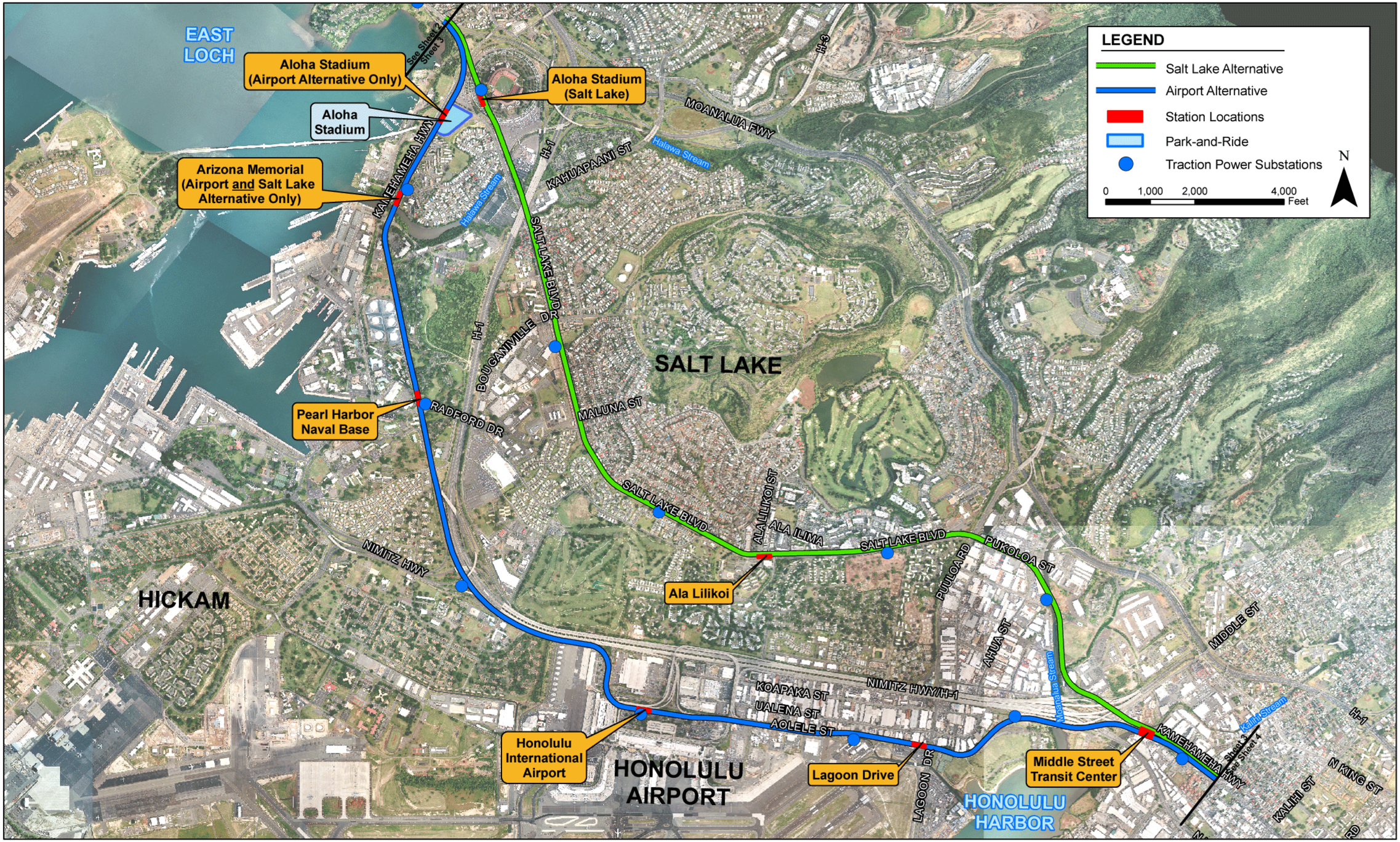

Figure 1-5: Fixed Guideway Transit Alternative Features (Aloha Stadium to Kalihi)

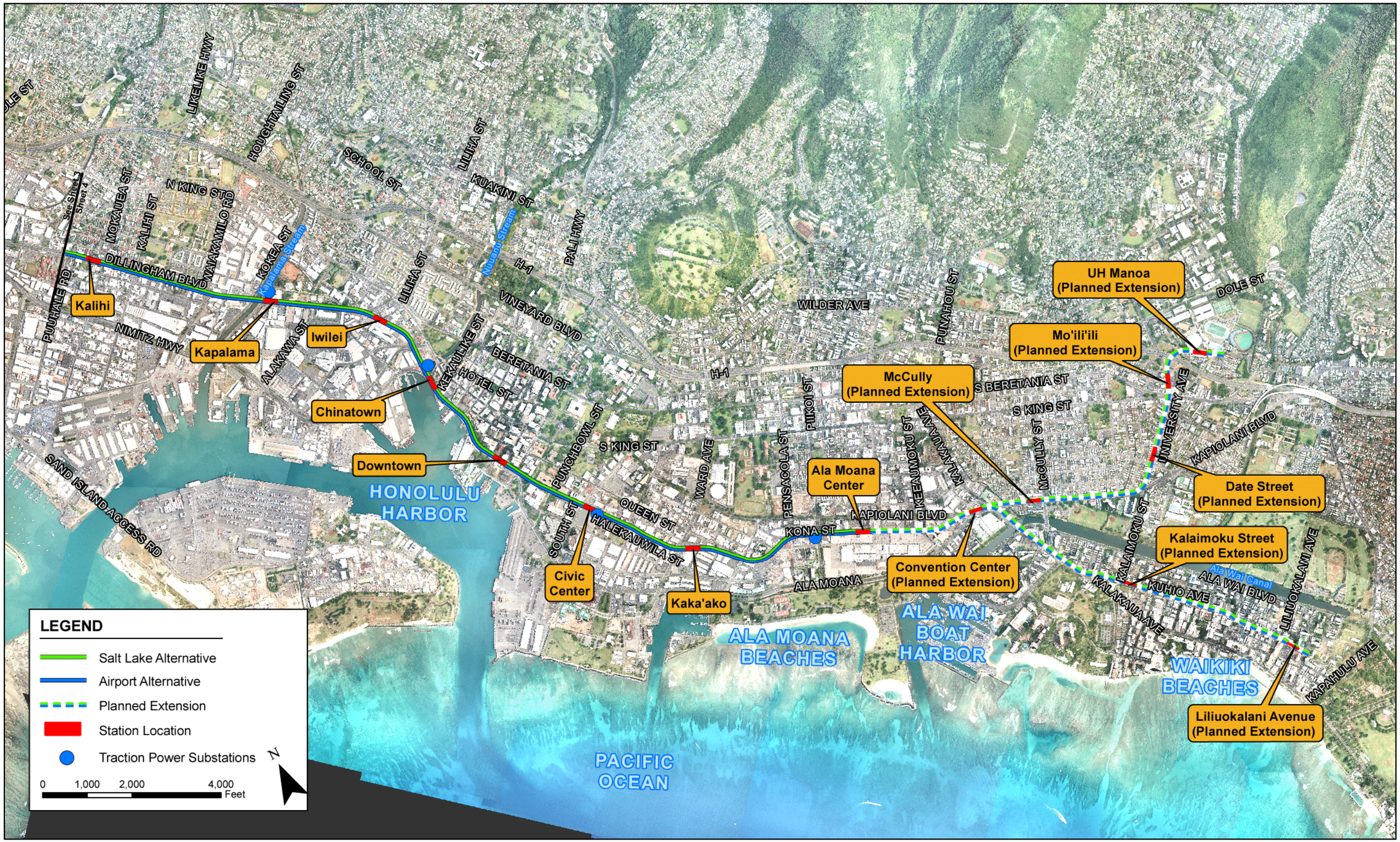

Figure 1-6: Fixed Guideway Transit Alternative Features (Kalihi to UH Mānoa)

Airport Alternative

The Airport Alternative would continue along Kamehameha Highway makai past Aloha Stadium to Nimitz Highway and turn makai onto Aolele Street and then follow Aolele Street Koko Head to reconnect to Nimitz Highway near Moanalua Stream and continuing to the Middle Street Transit Center (Figure 1-5). Stations would be constructed at Aloha Stadium, Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive. The total guideway length for this alternative would be approximately 20 miles and it would include 21 stations. The eventual guideway length, including planned extensions, for this alternative would be approximately 29 miles and it would include 33 stations.

Airport & Salt Lake Alternative

The Airport & Salt Lake Alternative is identical to the Salt Lake Alternative, with the exception of also including a future fork in the alignment following Kamehameha Highway and Aolele Street at Aloha Stadium that rejoins at Middle Street. The station locations discussed for the Salt Lake Alternative would all be provided as part of this alternative. Similarly, all the stations discussed for the Airport Alternative also would be constructed at a later phase of the project; however, the Aloha Stadium Station would be relocated makai to provide an Arizona Memorial Station instead of a second Aloha Stadium Station. At the Middle Street Transit Center Station, each line would have a separate platform with a mezzanine providing a pedestrian connection between them to allow passengers to transfer. The total guideway length for this alternative would be approximately 24 miles and it would include 23 stations. The eventual guideway length, including planned extensions, for this alternative would be approximately 34 miles and it would include 35 stations.

1.3.3 Features Common to All Build Alternatives

In addition to the guideway, the project will require the construction of stations and supporting facilities. Supporting facilities include a maintenance and storage facility, transit centers, park-and-ride lots, and traction power substations (TPSS). The maintenance and storage facility would either be located between North-South Road and Fort Weaver Road or near Leeward Community College (Figure 1-3 and Figure 1-4). Some bus service would be reconfigured to transport riders on local buses to nearby fixed guideway transit stations. To support this system, the bus fleet would be expanded.

2 Studies and Coordination

2.1 Wildlife and Vegetation

Section 7 of the Endangered Species Act of 1973 (ESA), as amended (7 USC 136; 16 USC 1531 et seq), requires Federal agencies to consider impacts on threatened or endangered species and on critical habitat of such species. It requires that Federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NOAA/FS), depending on whether terrestrial or marine species may be affected, respectively. If effects on protected species are identified, a Biological Assessment would be prepared to address the effects of any major construction activity on a listed or candidate species, or on the destruction or adverse modification of designated critical habitat. Subsequently, a Biological Opinion would be issued by the USFWS stating whether the Federal action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat (40 CFR 402).

The State of Hawai‘i’s counterpart law is Hawai‘i Revised Statutes (HRS) Chapter 195D, as amended, under which listed species are similarly protected. HRS 195D stipulates that where there may be an incidental take of a listed species, a Habitat Conservation Plan (HCP) must be “designed to result in an overall net gain in the recovery of Hawai‘i’s threatened and endangered species.”

The Federal Migratory Bird Treaty Act (MBTA) (16 USC 703-711) protects migratory birds listed in the MBTA by prohibiting the taking of any listed bird, or any part, nest, or egg of any such bird. “Take” is defined as an attempt to “pursue, hunt, shoot, capture, collect, or kill.” This act applies to all persons and organizations in the U.S., including Federal and State agencies. The Migratory Bird Division of the USFWS administers the MBTA.

The Marine Mammal Protection Act (MMPA) of 1972 (16 USC 1361-1407) protects marine mammals listed in the MMPA by prohibiting their taking in navigable waters of the United States and by U.S. citizens on the high seas, as well as importing marine mammals and marine mammal products into the U.S. “Take,” as defined by Congress, is “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal."

In letters sent in March 2008, a written request for a list of species that could potentially be affected by the Project was sent to each of the following regulatory agencies:

- U.S. Department of Interior, U.S. Fish and Wildlife Service
- U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service
- State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife
- Department of Land and Natural Resources, Division of Aquatic Resources

Table 2-1 summarizes the species specifically identified in correspondence from these agencies. A discussion of the replies received from these agencies follows the table.

Table 2-1: Threatened, Endangered, and Protected Species Identified by Agencies

Common Name	Scientific Name	Cited by	Status
Endangered Flora			
Koʻoloaʻula or red ʻilima	*Abutilon menziesii*	USFWS & DLNR-DOFAW	Endangered (S,F)
Maui chaff flower	*Achyranthes splendens spp. rotundata*	DLNR-DOFAW	Endangered (S,F)
Skottsberg's broomspurge	*Chamaesyce skottsbergii*	DLNR-DOFAW	Endangered (S,F)
Endangered Terrestrial Fauna			
ʻŌpeʻapeʻa or Hawaiian hoary bat	*Lasiurus cinereus semotus*	USFWS	Endangered (S,F)
ʻAlae ʻula or Hawaiian common moorhen	*Gallinula chloropus sandvicensis*	USFWS	Endangered (S,F)
ʻAlae ʻkeʻokeʻo or Hawaiian coot	*Fulica alai*	USFWS	Endangered (S,F)
Aeʻo or Hawaiian stilt	*Himantopus mexicanus knudseni*	USFWS	Endangered (S,F)
Koloa maoli or Hawaiian duck	*Anas wyvilliana*	USFWS	Endangered (S,F)

F = Federal; S = State
DLNR-DOFAW = State of Hawaiʻi Department of Land and Natural Resources, Division of Forestry and Wildlife
USFWS = U.S. Fish and Wildlife Service

In a letter dated April 29, 2008, the USFWS stated that no federally proposed or designated critical habitats occur within the study corridor. However, records show that one botanical listed species occurs in the study corridor: koʻoloaʻula or red ʻilima (*Abutilon menziesii*), and five faunal listed species have been observed: ʻōpeʻapeʻa or Hawaiian hoary bat (*Lasiurus cinereus semotus*), alae ʻUla or Hawaiian moorhen (*Gallinula chloropus sandvicensis*), ʻalae ʻkeʻokeʻo or Hawaiian coot (*Fulica alai*), aeʻo or Hawaiian stilt (*Himantopus mexicanus knudseni*), and koloa maoli or Hawaiian duck (*Anas wyvilliana*). These species may occur in locations within the study corridor other than those identified (see letters in Appendix A); but the common moorhen, coot, stilt, and koloa inhabit wetlands. The USFWS suggested that RTD or the FTA obtain an HDOT Certificate of Inclusion to the existing HCP for the management of koʻoloaʻula.

In a letter dated April 14, 2008, NOAA/FS provided a list of all protected species under its jurisdiction. In addition to the ESA, NOAA/FS-protected species are also defined by the MMPA (16 USC 1361-1407), as amended. NOAA/FS stated that "it does not appear that any portions of the route will specifically transit over marine water. Therefore, no marine ESA-listed species under our jurisdiction occur in the project area."

The NOAA/FS letter included a list of the following endangered species that occur in waters surrounding the Island of Oʻahu: Hawaiian monk seal (*Monachus schauinslandi*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera*

physalus), leatherback turtle (*Dermochelys coriacea*), hawksbill turtle (*Eretmochelys imbricata*), green turtle (*Chelonia mydas*), olive Ridley turtle (*Lepidochelys olivacea*), and loggerhead turtle (*Caretta caretta*). The remainder of the list consists of additional whales, dolphins, and seals protected under the Marine Mammal Protection Act (see correspondence in Appendix A, Agency Consultation Letters, for a complete list.)

In a letter dated April 2, 2008, DLNR-DOFAW noted their awareness of three endangered plants that have historical significance in the Kapolei-‘Ewa Plains area: the Maui chaff flower (*Archranthes splendens* spp. *rotundata*), coastal sandmat or Skottsberg’s broomspurge (*Chamaesyce skottsbergii*), and ko‘oloa‘ula. DLNR-DOFAW recommended that a plant survey be included in the Draft EIS.

In a letter dated May 1, 2006, the Department of Land and Natural Resources Division of Aquatic Resources (DLNR-DAR) noted that it is primarily concerned with whales, marine turtles, and monk seals. The DAR also requested including additional information in the EIS about avoiding, minimizing, or mitigating impacts, if any.

Personal communication was made on January 17, 2008 with the State botanist at DLNR-DOFAW concerning the status of the ko‘oloa‘ula at the 18-acre contingency reserve at North-South Road in Kapolei. This reserve is actively managed and there are plans to relocate any plants that remain outside the enclosure to the reserve in the near future.

2.2 Wetlands

Several Federal and State agencies are authorized to regulate inland surface and tidal waters or wetlands (collectively, “waters of the United States”), primarily through the Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA) of 1972 (33 USC 1251 et seq) and Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 USC 403), as well as associated State rules for water quality standards. The laws generally limit activities that may cause an adverse effect, such as dredging or filling.

Pursuant to 33 CFR 320–330 of the regulatory program of the U.S. Army Corps of Engineers (USACE), a Section 10 permit, per the RHA, is required for the placement of structures in or affecting the course, condition, location, or capacity of navigable waters (i.e., waters subject to the ebb and flow of the tides). Authorization under Section 404 of the CWA is also required for the discharge of dredged or fill material into waters of the United States and adjacent wetlands.

The USACE, in a letter dated April 10, 2007, noted that a permit would be required for:

1. Structures or work in or affecting “navigable waters of the United States” pursuant to Section 10 of the RHA of 1899, and
2. The discharge of dredged or fill material, into, including any redeposit of dredged material within, “waters of the United States” and adjacent wetlands pursuant to Section 404 of the CWA of 1972.

An application must be submitted to the USACE for a Jurisdictional Determination that delineates the extent of the waters affected by the Project. This application would require staking of the wetland boundary; a surveyed map; completion of the USACE's wetland delineation form identifying the presence of hydrology, hydrophytic vegetation, and hydric soils; and photographs of the uplands, wetlands, and watercourses on the site.

The substantive criteria used in evaluating Section 404 filling activities have been promulgated by the U.S. Environmental Protection Agency (EPA) in 40 CFR 230, also known as the "404(b)(1) Guidelines." To demonstrate compliance with these guidelines, applicants for Section 404 permits must conduct an extensive alternatives analysis to determine that there are no practicable alternatives to placing fill in wetlands, including the No Build Alternative. The guidelines establish a sequential approach to project planning beginning with "avoidance," followed by "minimization" if avoidance is not possible, and finally "mitigation" to compensate for any detrimental effects of filling wetlands. Coordination with the USACE and the USEPA would occur through a "Memorandum of Understanding for the NEPA/CWA Section 404 Integration Process for Surface Transportation Projects in the State of Hawai'i," if a CWA Section 404 or RHA Section 10 permit is needed. Mitigation would follow guidelines set forth in *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule.*

Under Section 404 of the CWA, the discharge of dredge or fill material into "waters of the United States," as defined by 33 CFR Part 328, automatically triggers the need for a permit from the USACE, which is called a Department of the Army (DA) permit. Under Section 401 of the CWA, the need for a DA permit triggers the need for a Section 401 Water Quality Certification from the Hawai'i Department of Health-Clean Water Branch and a Coastal Zone Management Consistency Certification from the State Office of Planning Coastal Zone Management Program office.

The State's general policy is to maintain or improve existing water quality in all State waters. All waters of the State are classified as either inland or marine waters. Inland waters are fresh, brackish, or saline waters and include streams, springs, wetlands, estuaries, anchialine pools, and saline lakes. Marine waters include embayments, open coastal waters, or oceanic waters. The State has defined water use classifications for inland and marine waters and set water quality criteria for each water use classification.

The State Commission on Water Resource Management (Water Commission) regulates activities affecting stream channels, which are defined as any natural or artificial watercourse with a definite bed and banks that periodically or continuously contains flowing water. Among the regulatory responsibilities of the Water Commission is the regulation of alterations to stream channels through a Stream Channel Alteration Permit.

Englund et al (Englund 2000a, 2000b) conducted field surveys between October 1997 and August 1998 for Phase II of the Pearl Harbor Biodiversity Project. Surveys for Phase II of the South Shore O'ahu Biodiversity Project were conducted from January 1998 to June 1999. Representative sampling stations were established in

each major Pearl Harbor and South Shore O‘ahu stream and wetland and included a complete range of estuarine habitats. Habitat condition for native aquatic organisms was evaluated both within sampling stations and throughout the study area. Most sampling stations were generally at or just above sea level (Englund 2000a, 2000b). Aquatic insects were sampled using dip nets, seines, aerial sweeps, and through benthic sampling. Sampling of damselflies and dragonflies (Odonata) was emphasized, because several of these are candidate threatened or endangered species. Terrestrial insects on vegetation immediately adjacent to riparian habitats were also sampled, because some riparian insects are an important part of the fish diet in the lower reaches of Pearl Harbor streams (Englund 2000a). Benthic communities were sampled using a dredge. Fish, crustacean, and mollusks were sampled using seine, dip, and gill nets. Some above-water observations were also made.

3 Methodology

3.1 Wildlife and Vegetation

3.1.1 Literature Review

A literature review and fieldwork were conducted to evaluate sections of the proposed alternatives for the presence of any protected, rare, threatened, or endangered wildlife and botanical species. Previous studies, pertinent literature, and USFWS critical habitat maps for O‘ahu were reviewed for the study area prior to undertaking the wildlife and botanical field surveys. Topographic maps and aerial photographs were examined to determine terrain and habitat characteristics, access, boundaries, and reference points. In addition, a request to the Hawai‘i Biodiversity and Mapping Program (HBMP) for a database of Federal and State-protected species (plants and animals) was made and this information was reviewed. The spatial parameters for the HBMP search were established following the literature review, and the parameter selected was 0.25 mile from the proposed project alignment.

In addition to agency-produced recovery plans, the following studies and reports were consulted for particular species: Miles 1986 and Vanderwerf 2003 for white terns; Vanderwerf 1997 and USFWS 2001 for O‘ahu Elepaio; Kepler 1990 and USFWS 1997 for Hawaiian hoary bat; USFWS 2005 for endangered waterbirds; and Ainley 1997 for Newell’s shearwater (*Puffinus auricularis newelli*).

Table 3-1 summarizes the threatened, endangered, and protected species identified as possibly occurring in the area to be surveyed for the Project.

3.1.2 Field Surveys

Wildlife Surveys

Field observations of wildlife were made along the proposed project alignment during the Alternatives Analysis phase of the Project from February 19 to 21, 2006. Daytime field observations were made on May 19, 2006 at proposed sites for maintenance and storage facilities, park-and-ride lots, and transit stations.

Wildlife field surveys and observations along the proposed alignment were made on the morning of September 9, 2007. The makai perimeter of the site of a proposed maintenance and storage facility on property owned by the Department of Hawaiian Home Lands (west and adjacent to Leeward Community College) was visited around 3:45 p.m. on December 30, 2007. Additional field observations were made in a stand of ironwoods (*Causaurina equistefolia*) along the southern edge of Kapi‘olani Park at approximately 5:30 p.m. on December 30, 2007 to search for white terns.

Table 3-1: Threatened, Endangered, and Protected Species Identified by Research

Common Name	Scientific Name	Status	Literature Source
Endangered Flora			
‘Awīwī	*Centaurium sebaeoides*	Endangered (S,F)	HBMP, Bishop Museum website
‘Ihi‘ihi	*Marsilea villosa*	Endangered (S,F)	The Recovery Plan for Marsilea Villosa (USFWS 1996)
Endangered Terrestrial Fauna			
O‘ahu elepaio	*Chasiempis sandwichensis ibidis*	Endangered (S,F)	Vanderwerf 2001 and others
‘Alae ke‘oke‘o or Hawaiian coot	*Fulica americana alai*	Endangered (S,F)	Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision (USFWS 2005); and others
Koloa maoli or Hawaiian duck	*Anas wyvilliana*	Endangered (S,F)	
Ae‘o or Hawaiian stilt	*Himantopus mexicanus*	Endangered (S,F)	
‘Alae ‘ula or Hawaiian common moorhen	*Gallinula chloropus sandvicensis*	Endangered (S,F)	HBMP, Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision (USFWS 2005); and others
Protected Migratory Waterbirds			
Pacific golden plover	*Pluvialis fulva*	MBTA Protected	Draft Revised Recovery Plan for Hawaiian Waterbirds (USFWS 2005); and others
Black-crowned night heron	*Nycticorax nycticorax hoactii*	MBTA Protected	
Ruddy turnstone	*Arenaria interpres*	MBTA Protected	
Wandering tattler	*Heteroscelus incanus*	MBTA Protected	
State Threatened and Endangered Terrestrial Fauna			
Pueo	*Asio flammeus sandwichensis*	Endangered (S)	Various
Newell’s shearwater	*Puffinus auricularis newelli*	Threatened (S)	Various
White tern	*Gygis alba*	Threatened (S)	Miles 1986; Vanderwerf 2003

F = Federal; S = State
HBMP = Hawai‘i Biodiversity and Mapping Program
MBTA = Migratory Bird Treaty Act
DLNR = State of Hawai‘i Department of Land and Natural Resources
USFWS = U.S. Fish and Wildlife Service

Brief visits to a site will not yield all the wildlife components for that site or habitat type, even under the best conditions. The presence and quantity of a species are influenced by many factors such as the time of day, season, and a host of environmental conditions including the presence of disturbances that can cause wildlife to temporarily move out of the area. However, these visits generally reveal what can be expected, based on previous anecdotal and scientific records of similar sites and habitats. They are therefore important in verifying and checking the species components and environmental characteristics that typify a site, but conclusions derived from these visits must be interpreted conservatively.

Point Counts

The point count method provides a species list and quantitative results for a given area in a short period of time (Blondel 1981). Quantitative results include the number of individuals of each species (an index of abundance); the total species per section of the corridor (species richness); and the average number for each point count station (average richness) for each section and the total corridor.

Point counts were made from December 30, 2007 to January 2, 2008 along the proposed project alignment. Station point counts were conducted between 7:00 a.m. and 11:00 a.m. All birds seen and heard for an 8-minute period were recorded.

Point counts were made at approximately 1-mile intervals, except from Kalihi to UH Mānoa and Waikīkī, which were spaced every 0.5 miles to improve the detection of the State-listed threatened white tern. White tern sightings were also recorded between count stations along the selected alignment. All birds seen and heard at all distances from the point count station were recorded for 8 minutes.

Vehicle Transect Survey

On May 31 and June 1, 2008, a survey for white terns was performed by vehicle along the project alignments from Aloha Stadium to UH Mānoa and Waikīkī. The purpose of the survey was to ascertain the seasonal abundance of terns during this portion of their breeding and nesting season. Previous studies have suggested more terns would be present during this time of year (Vanderwerf 2003). The survey was made from a vehicle moving along the study corridor at an average speed of 20 miles per hour. A driver and two observers recorded all white terns seen.

Vegetation Surveys

Coordination was conducted with Federal and State resource agencies, including the USFWS and the DLNR, to help determine potential interactions with protected species.

A general description of the vegetation types is provided for the study corridor, with emphasis on undeveloped land in the ‘Ewa area. The width of the survey corridor was 100 feet from each side of the centerline of the proposed alignment. In areas where effects on vegetation are expected to extend beyond 100 feet, the width of the survey area was expanded. Sections of the study corridor were rated for the relative abundance of native and introduced vegetation.

For sections of the study corridor where rare or endangered species have been previously reported, an intensive survey was conducted prior to project design to establish whether these plants or populations still exist. Federally listed plants found within the study corridor were documented by photographs and mapped using global positioning satellites.

3.2 Wetlands

Fieldwork was conducted to identify areas within the study corridor for ground conditions that would qualify as jurisdictional wetlands or navigable waters of the United States. Functions and values (e.g., waterbird habitat, stormwater storage, riverine watercourse) were qualitatively determined for potentially affected wetlands.

A preliminary wetland delineation process was followed using the methods and guidelines of the 1987 USACE *Wetlands Delineation Manual*. The wetland delineation process followed these steps:

- Preliminary determination of wetlands began with a review of hydric soils within the study corridor using the Natural Resource Conservation Service's (NRCS) (formerly the Soil Conservation Service) *Soil Survey of O'ahu* and visual investigation of those potential wetlands.
- Areas that appeared to be potential wetlands were investigated further; hydrophytic vegetation was documented by creating a species list of all plant species in the area, including estimated percent cover and indicator categories listed in the *National List of Plant Species that Occur in Wetlands: Hawai'i (Region H)* (USFWS 1988).
- Areas with hydrophytic vegetation were further examined for hydrology and the presence or absence of hydric soils. The NRCS list of hydric soils for Hawai'i was examined.
- Information was recorded on the USACE Routine Wetland Determination Data Form (USACE 1987).
- Although the initial methods anticipated flagging, surveying, and mapping of wetland boundaries for submittal to USACE, insufficient design information at the planning stage (e.g., the exact location of bridge crossings) required a change to a more rudimentary procedure and resulted in qualitative descriptions. Detailed delineation would therefore be a future task to be coordinated during the Project's design phase.
- Boundaries for riverine watercourses were defined at the top of stream banks. For planning purposes, a minimum buffer of 20 feet is recommended as a construction setback, but site-specific characteristics would be determined at the design phase.

The "Memorandum of Agreement Between The Department of the Army and the Environmental Protection Agency Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines*"* (1990) was followed. This memorandum specifies a three-part process known as *mitigation sequencing,* which involves avoidance, minimization, and compensatory mitigation to help guide mitigation decisions. An assessment of direct and indirect consequences was made by reviewing conceptual engineering plans for the proposed project alignment.

For site-specific anticipated impacts, consultation will be initiated with the USACE, the State Department of Health, and the Office of Planning Coastal Zone

Management Program. Effects on streams are described in following sections (Affected Environment, Consequences and Mitigation). It is anticipated that streams with widths that are over 150 feet at the crossing point would be affected. The results of the delineation, analyses of anticipated effects, and proposed mitigation were documented for each site. The functions and values of affected wetlands were assessed using best professional judgment to help estimate the compensatory mitigation that may be required. Compensatory mitigation concepts are discussed to the extent possible at this stage of the planning process.

A permit application for in-stream construction of piers will be prepared and submitted to USACE for authorization under Section 10 of the RHA and/or Section 404 of the CWA.

4 Affected Environment

A distinctive feature of O‘ahu’s geomorphology is the broad plain that extends from ‘Ewa and Kalaeloa across Pearl Harbor to Diamond Head. It is composed of raised coralline limestone, possessing natural harbors, dry leeward climate, and abundant freshwater streams with headwaters in the Ko‘olau and Wai‘anae Ranges. Perennial streams are sustained by groundwater from high-level aquifers. On the coastal plain, perennial flow may originate from basal groundwater springs. Where groundwater is not accessible in a drainage basin, streams exhibit intermittent flow because they respond only to rainfall and runoff. Freshwater streams that enter the marine coastal waters create estuaries at stream mouths and embayment estuaries such as Pearl Harbor, where freshwater nutrients stimulate productivity.

The Project’s study corridor runs through vegetation zones A and B of Ripperton and Hosaka (1942). Zone A is represented by the coastal zone along the ‘Ewa Plain from sea level to 500 feet. Zone A has a mean annual temperature of 75 degrees Fahrenheit (˚F). There is typically less than 20 inches of rainfall, which originates from the southwest. The ground cover is sparse and conditions are semi-desert. Kiawe (*Prosopis pallida*), haole koa (*Leuceana leucocephala*) and klu (*Acacia farnesiana*) grow where roots can penetrate to the groundwater. ‘Ilima (*Sida fallax*) and uhaloa (*Waltheria indica*) are common and annual grasses and herbs are scarce, except following rains.

Zone B is from sea level to 2,000 feet elevation above Zone A. The mean annual temperature is 70˚ F and rainfall is from 20 to 40 inches, originating from the southwest. Vegetation is similar to Zone A, but plants are more numerous and vigorous due to increased rainfall. Annuals are longer lived, and lantana forms dense stands. Both perennial and annual grasses are present. Annual herbs are prominent during and following rainy periods (Schwartz 1949).

The Hawaiian Islands have many wetlands and wetland habitats. On O‘ahu, perennial and intermittent streams originating in the higher elevations of the Ko‘olau and Wai‘anae Mountains represent a major “riverine” or stream wetland system.

Wetland complexes within the study area from Kapolei at the Wai‘anae end of the study corridor to Waikīkī at the Koko Head end are associated with riverine, tidal, and spring systems in three areas: Pearl Harbor, Salt Lake, and Waikīkī. Over time, land development has altered or destroyed most of these wetlands, leaving only a few remnants today. All streams within low-lying areas and especially at road crossings have been altered through channelization, lining, dredging, or other alteration (COWRM 1990).

The past decades and century of urbanization have resulted in a highly altered environment. This is reflected in the present state of vegetation and wildlife communities in the study area. To preserve and manage the important remaining wetlands that serve as waterbird habitat, the Pearl Harbor National Wildlife Refuge (NWR) has been established at two locations: Honouliuli and Waiawa. Figure 4-1 through Figure 4-4 show some of the spatial relationship between the Project, some of the important natural resources, and the location of point count stations.

4.1 Wildlife

4.1.1 Existing Documentation on Protected Species

Coordination with governmental agencies and the literature review indicate that there are no designated critical habitats within the proposed study area. However, the following species were reported as being present or potentially present in or near the study area:

- O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*) is a monarch flycatcher endemic to the forests on O‘ahu. The O‘ahu ‘elepaio is provided for in the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006), which indicates there are approximately 2,000 birds in the wild. The recovery area illustrated in the plan for the O‘ahu ‘elepaio is located well mauka of the proposed project alignment.
- Four waterbirds are listed as endangered: the Hawaiian coot (*Fulica americana alai*), Hawaiian duck (*Anas wyvilliana*), Hawaiian common moorhen, and Hawaiian stilt (*Himantopus mexicanus*). They inhabit similar habitats, are often found together, and are generally restricted to wetlands (freshwater and marine estuaries) but will visit temporarily flooded areas. Habitat along the study corridor where some or all of these species have been previously observed include Pearl Harbor NWR, Waiawa Spring, Waiau Spring, Pū‘ōhala Marsh, and Kalauao Spring (the Sumida Watercress Farm). The Draft Revised Recovery Plan for Hawaiian Waterbirds (USFWS 2005) provides recovery plans for these four species and indicates that the core habitats on the southern coast of O‘ahu are the Pearl Harbor NWR and Pū‘ōhala Marsh Wildlife Sanctuary. The plan lists no supporting habitat on the southern coast of O‘ahu.
- The following four indigenous shorebirds protected by the MBTA are known to be present in the study area:
  - The Pacific golden plover (*Pluvialis fulva*) breeds on Arctic tundra in the summer and spends the winter primarily in South Asia and Australia, with a few in California and Hawai‘i.
  - The black-crowned night heron (*Nycticorax nycticorax hoactii*) is native to Hawai‘i and present throughout the year. They nest in colonies and feed in both freshwater and saltwater wetlands.
  - The ruddy turnstone (*Arenaria interpres*) is a sandpiper that breeds in the northern parts of Eurasia and North America during the summer and winters on coastlines almost worldwide, including Hawai‘i.
  - The wandering tattler (*Heteroscelus incanus*) summers and breeds in Alaska and northwestern Canada. In winter they are found on rocky islands in the Southwest Pacific, including Hawai‘i, and on rocky Pacific coasts from California to South America and as far as Australia.

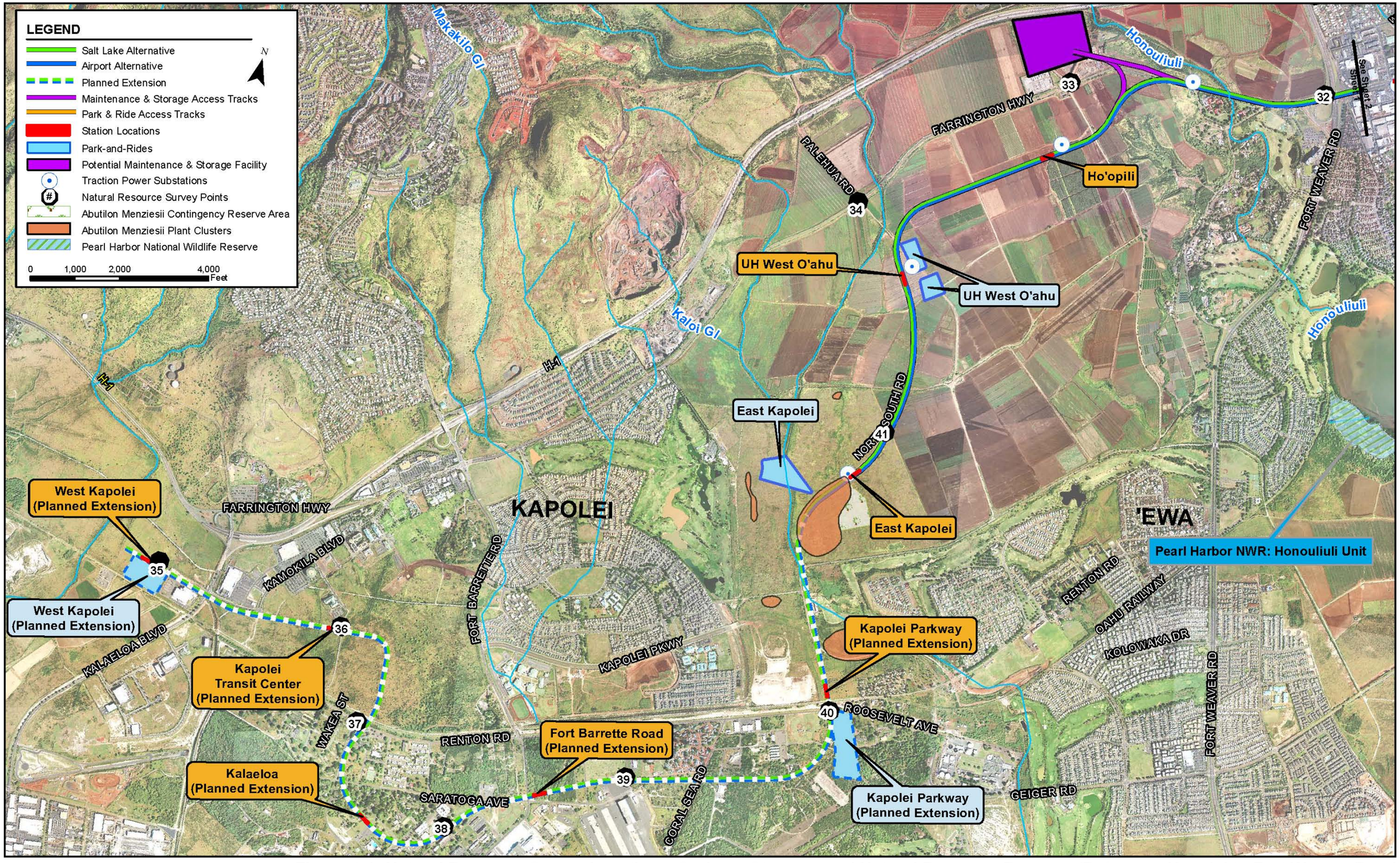

Figure 4-1: Natural Resource Survey Locations, Springs, Streams, and Natural Resource Reserves/Refuges – Kapolei to Fort Weaver Road

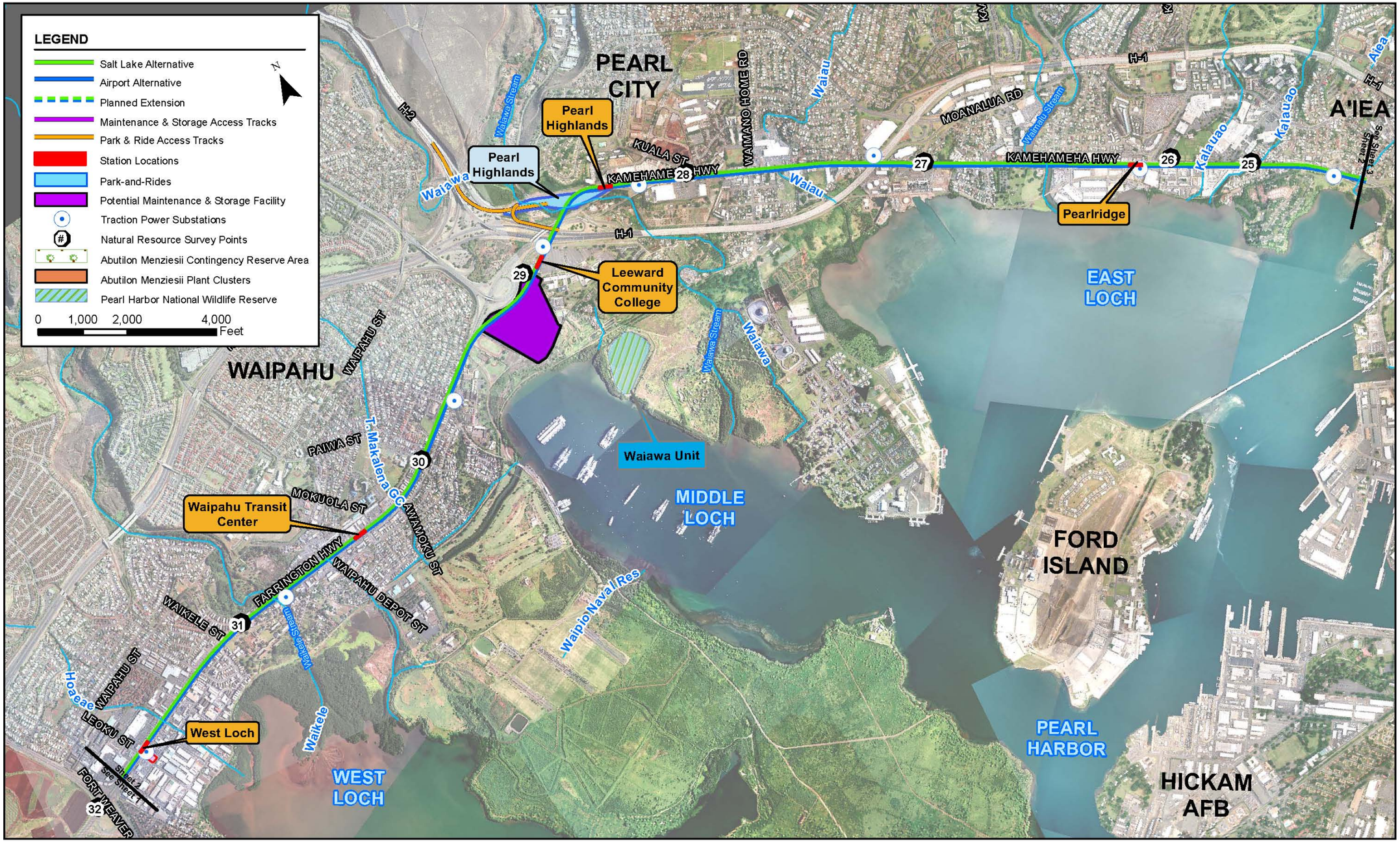

Figure 4-2: Natural Resource Survey Locations, Springs, Streams, and Natural Resource Reserves/Refuges – Fort Weaver Road to Aloha Stadium

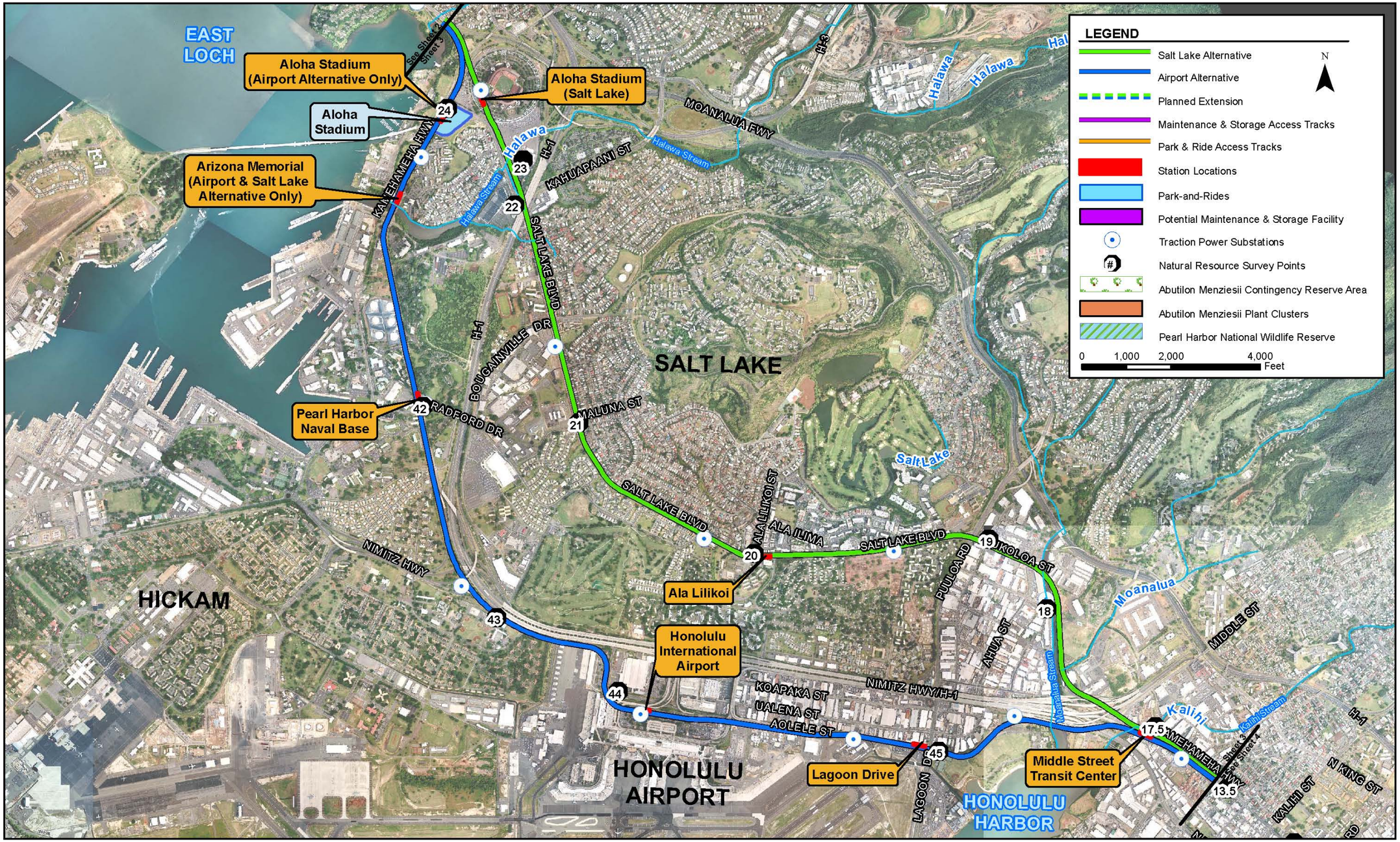

Figure 4-3: Natural Resource Survey Locations, Springs, Streams, and Natural Resource Reserves/Refuges – Aloha Stadium to Middle Street

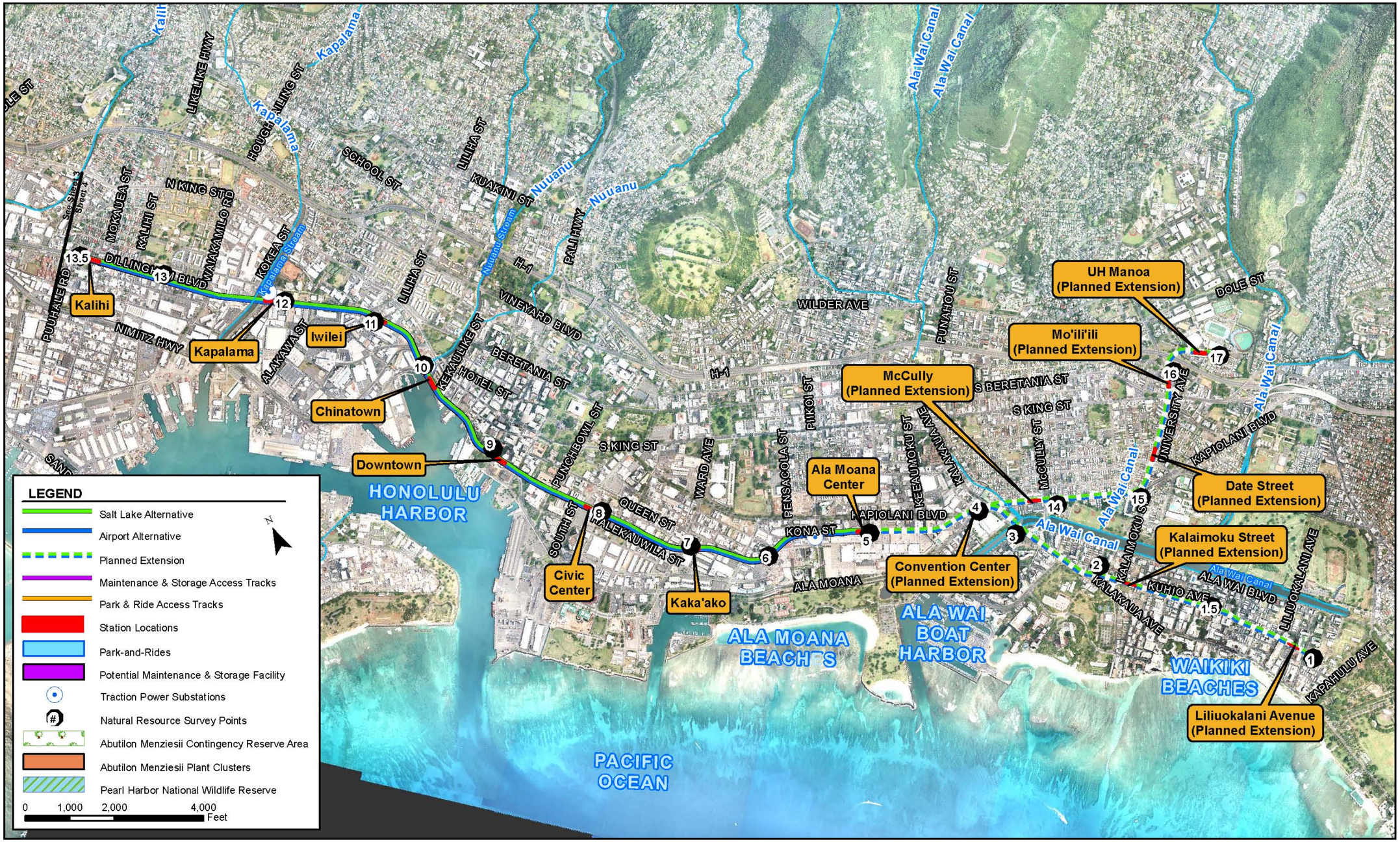

Figure 4-4: Natural Resource Survey Locations, Springs, Streams, and Natural Resource Reserves/Refuges – Middle Street to UH Mānoa/Waikīkī

- The federally threatened Newell's shearwater is reported to breed on O'ahu but no nesting colonies have been found (Ainley 1997). Small numbers of fledgling Newell's shearwater have been recovered on O'ahu following drowning incidents, and were probably individuals attracted to shore from elsewhere by coastal lights (Ainley 1997).
- The Pueo (*Asio flammeus sandwichensis*) is a subspecies of short-eared owl endemic to Hawai'i that nests on the ground. Its habitat includes wet and dry forests on all the Hawaiian Islands. The Pueo population on O'ahu is considered endangered by the State of Hawai'i. It has been observed on the 'Ewa Plain but is in decline on O'ahu due to habitat loss. There are no recovery plans or designed critical habitat for the Pueo.
- The white tern is listed as a threatened species by the State of Hawai'i. The population occurs mainly along the southern coastline of Honolulu from Diamond Head to Hickam Air Force Base. White terns are a relatively recent bird to the avifauna of O'ahu but are known to be present in portions of the study area and are listed as threatened in the State of Hawai'i. Prior to the 1960s, they could only be seen with regularity in the Northwestern Hawaiian Islands. Their establishment on O'ahu may be a result of crowded conditions elsewhere, which have forced the birds to search for other roosting and nesting localities (Miles 1986; Vanderwerf 2003). White terns are currently found only along the southeastern coast of O'ahu, where they breed and roost exclusively in large trees. No white terns occur west of Hickam Air Force Base or east of Niu Valley, perhaps because these are the last areas in each direction that have groups of large trees (Vanderwerf 2003). The peak nesting period is from February through July.
- National Marine Fisheries Service and/or DLNR-DAR noted that the following endangered species may occur in waters or shorelines around O'ahu, but not in the study area: Hawaiian monk seal, humpback whale, sperm whale, blue whale, fin whale, 13 other species of whale, leatherback turtle, hawksbill turtle, green turtle, olive Ridley turtle, loggerhead turtle, spinner dolphin, and 7 other species of dolphin.

4.1.2 Results of Fieldwork

Except for portions of the 'Ewa Plain where there is extant farmland and ruderal (weedy) sites, the study corridor consists of heavily urbanized environments. Birds are the most prominent wildlife in the study area, so the primary focus of field investigations was to document the species of birds and their abundance at count stations along the study corridor (Figure 4-1 through Figure 4-4). Observations of species encountered between stations was also reported (Table 4-1).

The marine mammal and turtle species identified by the National Marine Fisheries Service and DLNR-DAR were not addressed during field work because of lack of habitat in the study area. No small mammal trapping was conducted. PB 1997 identified the Norway rat (*Rattus norvegicus*) and the house mouse (*Mus musculus*)

occurring in Kapolei. It is likely that the Norway rat, black rat (*Rattus rattus*), and house mouse occur throughout the study corridor. A small Indian mongoose (*Herpestes auropunctatus*) was observed along Franklin D. Roosevelt Avenue and Hornet Street in Kalaeloa and is also expected throughout the length of the study corridor. Bruner 1990 observed feral cats (*Felis cattus*) at Makaiwa Hills. PB 1997 reported seeing feral cats and feral dogs (*Canis familiaris*) at east Kapolei. No cats or dogs were seen during the current survey.

The endangered Hawaiian bat was not observed during the Alternative Analyses phase in 2006 or during the current survey. Bats occur sporadically on O‘ahu and may be migrants or vagrants (Kepler 1990). Bruner 1990 did not find any bats on Makaiwa Hills in ‘Ewa. Nagata 1996 does not mention the bat in his discussion of mammals in a biological survey of East Kapolei. PB 1997 does not list the bat as occurring along the North-South Road corridor in ‘Ewa. Ohashi 1998 found no bats.

On four days from December 30, 2007 to January 2, 2008, 48 bird point count stations were surveyed along the study corridor. Count station intervals were 0.5 miles from Waikīkī to Kalihi, to better detect the State-threatened white tern. All other areas were surveyed at 1-mile intervals.

Twenty-five bird species were encountered during the current survey period. This was one less than the number encountered during the Project’s Alternative Analyses phase, when surveys were conducted in February and May 2006. The northern mockingbird (*Mimus polyglottos*), barn owl (*Tyto alba*), ring-necked pheasant (*Phasianus colchicus*), chestnut (*Lonchura malacca*), and nutmeg manikins (*Lonchura punctulata*) were encountered in the 2006 surveys. During the current survey, the wandering tattler (*Tringa incana*, formerly *Heteroscelus incanus*), ruddy turnstone (*Arenaria interpres*), Pacific golden plover (*Pluvialis dominica*), and cattle egret (*Bulbulcus ibis*) were found at the Sumida Watercress Farm. Flocks of mannikins (*Lonchura* spp.) were also present but not identified to species. No barn owls or northern mockingbirds were detected. Because these studies were not a comprehensive census of birds using the study corridor, the differential results between the two surveys are due to chance encounters with wildlife and do not necessarily reflect biological significance.

Table 4-1: Bird Point Count Survey Results

	Status	Kapolei to Fort Weaver Road	Fort Weaver Road to Aloha Stadium	Aloha Stadium to Middle Street	Middle Street to UH Mānoa and Waikīkī	Entire Transit Corridor Totals	Per-Station Average Count (Standard Error)	Stations with Species Present (Percent Frequency)
Number of Count Stations per Section		10	8	11	19	**48**		
Approximate Section Length (mile)		8.9	7.0	8.9	8.9	**33.7**		
Species								
Hawaiian Stilt	Endangered (S,F)		5			5	0.10 (01.0)	1 (2.1)
Mallard/Koloa	Koloa is Endangered (S,F)	2				2	0.04 (0.04)	1 (2.1)
White Tern	Threatened (S)				9	9	0.19 (0.10)	4 (8.3)
Pacific Golden Plover	MBTA-Protected Indigenous	4	7	13	3	27	0.56 (0.23)	13 (25.0)
Black-Crowned Night Heron	MBTA-Protected Indigenous		1	2		3	0.06 (0.04)	3 (6.3)
Ruddy Turnstone	MBTA-Protected Indigenous		6			6	0.13 (0.13)	1 (2.1)
Wandering Tattler	MBTA-Protected Indigenous		1			1	0.02 (0.02)	1 (2.1)
Zebra Dove	Gamebird	26	39	25	121	211	4.40 (0.63)	40 (83.3)
Common Myna		33	41	38	75	187	3.90 (0.53)	42 (87.5)
Spotted Dove	Gamebird	20	12	14	104	150	3.13 (0.52)	36 (75.0)
English Sparrow		6	16	24	67	113	2.35 (0.47)	27 (56.3)
Red-Vented Bulbul		30	28	19	26	103	2.15 (0.32)	28 (58.3)
Rock Dove			15	1	44	60	1.25 (0.53)	11 (22.9)
Cattle Egret	MBTA-Protected Non-indigenous		5	38		43	0.90 (0.47)	10 (20.8)
Japanese White Eye		7	4	7	18	36	0.75 (0.17)	19 (39.6)
Java Sparrow			3	5	23	31	0.65 (0.30)	8 (16.7)
Red Crested Cardinal		18	5	1	5	29	0.60 (0.34)	8 (16.7)
House Finch	MBTA-Protected Non-indigenous	7	1	9	11	28	0.58 (0.16)	14 (29.2)
Common Waxbill				13	5	18	0.38 (0.26)	4 (8.3)
Unknown		1	3		6	10	0.21 (0.13)	4 (8.3)
Mannikins (*Lonchura* spp.)			8			8	0.17 (0.17)	1 (2.1)
Gray Francolin	Gamebird	4				4	0.08 (0.07)	2 (4.2)
Northern Cardinal	MBTA Protected Non-indigenous	3	1			4	0.08 (0.05)	3 (6.3)
Black Francolin	Gamebird	3				3	0.06 (0.05)	2 (4.2)
Saffron Finch		1				1	0.02 (0.02)	1 (2.1)
Total Species or Species Richness		**15**	**19**	**14**	**14**	**25**		
Average Species per Station or Average Richness (Standard Error)		**5.80 (0.47)**	**6.75 (0.85)**	**6.00 (0.62)**	**5.58 (0.36)**	**5.92 (0.22)**		

Bird point count surveys were conducted between December 30, 2007 and January 2, 2008
F = Federal; S = State
MBTA = Migratory Bird Treaty Act

The survey found birds that are common to the lowlands and urban environments of O‘ahu. Overall, the most abundant species were the introduced zebra dove (*Geopelia striata*), common myna (*Acridotheres tristis*), spotted dove (*Streptopelia chinensis*), English sparrow (*Paser domesticus*), Red-vented bulbul (*Pycnonotus cafer*), and rock dove (*Columba livia*). Common mynas were most frequently observed on count stations. They were present at 42 out of 48 count stations, but had a lower overall count than zebra doves, which appeared in 40 out of 48 count stations. White terns appeared in 4 of the 48 count stations and entirely between Middle Street and the University/Waikīkī area, where large trees are present along the streets and in Kapi‘olani Park. Endangered stilts were found at wetlands associated with watercress cultivation at Waiawa and Kalauao springs (Sumida Watercress Farm) and at the Hawaiian Electric Company’s (HECO) Waiau Power Plant across the highway from Waiau spring. These springs are shown on Figure 4-2. Native black-crowned night herons (*Nycticorax nycticorax*) were present at Moanalua Stream, Kalauao Spring, and near the Airport over Aolele Street.

Kapolei to Fort Weaver

The section from Kapolei to Fort Weaver Road was approximately 9 miles in length. Ten point count stations were sampled along this section. Although the area is rapidly developing, it provides a greater diversity of terrestrial wildlife habitat than any other area of the study corridor. Wildlife habitat such as kiawe woodlands, cultivated fields that include fallow fields, wayside brush, and haole koa scrub were present. Gray and black francolins were heard and seen, especially along the North-South Road route where a drainage channel and open fields provide grass cover favored by both species.

Fifteen species were encountered within this section. The average number of species per count station was 5.80 (SE=0.47 [SE is the standard error of the average. It is a measure of the uncertainty of that average that was derived from the counts. SE equals the standard deviation divided by the square root of the sample size.]). Common mynas were most numerous followed by the red-vented bulbul. A pair of mallard/koloa ducks (*Anas platyrhynchos/Anas wyviliana*) was seen at a distance flying over the agriculture fields along the North-South Road route. Field identification of mallard/koloa hybrids and true koloa is difficult, and positive identification requires closer inspection in the hand. Therefore, there was no attempt to definitively identify these ducks. A large flock of about 800 to 900 cattle egrets were found in a recently disked field in this same area. During the surveys conducted in 2006, a non-native common barn owl (*Tyto alba*) was observed within Kalaeloa. No owls were encountered during the current survey.

There have been a number of wildlife surveys in the ‘Ewa Plain and adjacent foothills of the Wai‘anae Range (Bruner 1990; Nagata 1996; PB 199; Ohashi 1998) in recent years. The following species have also been reported in the area:

- Eurasian skylark (*Alauda arvensis*) (Ohashi 1998; PB 1997)
- Japanese bush warbler (*Cettia diphone*) (Ohashi 1998)
- White-rumped shama (*Copsychus malabaricus*) (Ohashi 1998; PB 1997)

- Orange-cheeked waxbill (*Estrilda melapoda*) (Nagata 1996)
- Red avadavat (*Amandava amandava*) (Ohashi 1998; Bruner 1990; PB 1997)
- Warbling silverbill (*Lonchura malabarica*) (PB 1997)

Fort Weaver to Aloha Stadium

The section between Fort Weaver Road and Aloha Stadium runs along highly urbanized Farrington Highway, through Waipahu and along Kamehameha Highway through Pearl City, Waiau, Kalauao, ʻAiea, and Hālawa. It is approximately 7 miles and is the shortest section of the corridor. Eight point count stations were surveyed along the section. Along Farrington Highway in Waipahu, the proposed alignment would pass over Hoʻaeʻae, Waikele, Kapakahi, and Makalena Streams. Along Kamehameha Highway, it would pass over Waiawa, Waimalu, Kalauao, ʻAiea, and Hālawa Steams, all of which are channelized as they cross Farrington and Kamehameha Highways.

This section also includes Waiawa Spring south of Leeward Community College; Kalauao Spring, which feeds the Sumida Watercress Farm; and Waiau Spring, north of the HECO Waiau Power Plant. A point count station detected a number of shorebird species, including five federally listed endangered Hawaiian stilt, at the Sumida Watercress Farm. The wandering tattler, Pacific golden plover, and ruddy turnstone (common migratory shorebirds and winter residents) were present at the Sumida Watercress Farm. Although not observed in the current survey, the federally listed endangered common moorhen has been recorded from the Sumida Watercress Farm (HBMP 2006). Six more Hawaiian stilts were also present in a small earthen impoundment within the HECO Waiau Power Plant site, and stilts have been observed within a watercress farm at Waiawa Spring outside the current survey period.

The study corridor within this section is about 0.5 miles from the Waiawa Unit of the Pearl Harbor NWR, located on Pearl City Peninsula southeast of Leeward Community College. This refuge was established to protect Hawaiʻi's four federally listed endangered waterbirds: the Hawaiian stilt, coot, common moorhen, and koloa. It is one of two units that make up Pearl Harbor NWR, which is considered core habitat for recovery of these species. The other, Honouliuli Unit, is in West Loch (Figure 4-1). A large cattle egret/black-crowned night heron rookery occurs in mangroves on the northeast side of West Loch on the Waipiʻo Peninsula (Figure 4-2) adjacent to the Pūʻōhala Marsh Wildlife Sanctuary, which is the other core habitat for Hawaiʻi's endangered waterbirds along the south shore of Oʻahu. Pūʻōhala Marsh is about 0.25 miles from the study corridor.

This section also includes former naval property west of Leeward Community College that is the site of a proposed maintenance and storage facility. The makai perimeter of the parcel is about 1,000 feet from the Waiawa Unit of Pearl Harbor NWR and about 250 feet from the shore of Middle Loch. The site is dominated by haole koa, kiawe, and shower trees with open areas dominated by dense growth of Guinea grass (*Panicum maximum*).

Nineteen species of birds were encountered within this section of the study corridor. This is the highest number of species found within any of the sections. The diversity

results from the number of wetland sites, principally the springs that occur in the area. The average number of species for each station was 6.75 (SE=0.85). The most abundant species was the common myna, followed by the zebra dove and red-vented bulbul. The most noteworthy species present within this section was the Hawaiian stilt, which was found at the Sumida Watercress Farm (Kalauao Spring), Waiawa Spring, and the HECO Power Plant site in Waiau. Endangered common moorhen have been present at the Sumida Watercress Farm according to the HBMP, but none were observed during the current survey.

Aloha Stadium to Kalihi

Point Count

The section from Aloha Stadium to Middle Street runs along Salt Lake Boulevard, a dense residential area of single-family residences and multifamily high rises, through the light industrial area of Māpunapuna across Moanalua Stream to Kalihi Stream. A section also runs along Kamehameha Highway crossing Hālawa Stream to North Nimitz Highway to just north of the Airport, along Aolele Street to Lagoon Drive. This section is approximately 9 miles long. Eleven point count stations were surveyed and 14 species were encountered within this section. The average number of species per count station was 6.00 (SE=0.62). The cattle egret and common myna were the most abundant species encountered. A drainage canal is present along Aolele Street and is used by black-crowned night herons as feeding habitat. A cattle egret/heron roost is located in a stand of mangrove within Keʻehi Lagoon about 3,300 feet south of the intersection of Aolele Street and Lagoon Drive. Keʻehi Lagoon mudflats provide shorebird feeding habitat.

Ohashi 2002 conducted a wildlife survey in the area proposed as a maintenance and storage facility between Middle Street and Kalihi Stream. The results of the 2002 survey were similar to current observations. A black-crowned night heron was seen foraging in Kalihi Stream, but no native species could be found on the site that was used as a truck and heavy equipment depot.

Vehicle Transect

Seven white terns were seen on June 1, 2008 along the Airport alignment and six white terns were seen on June 1, 2008 along the Salt Lake alignment. Terns were primarily observed near the airport and Fort Shafter.

Kalihi to UH and Waikīkī

Point Count

The section from Kalihi Stream to the UH and Waikīkī is about 9 miles long. Point count stations were spaced at 0.5-mile intervals to intensify sampling for the detection of the State-listed threatened white tern. Nineteen point count stations were in this section. The average number of species encountered at each point count station was 5.58 (SE=0.36). The most abundant species were the zebra dove, followed by the spotted dove and common myna. Fourteen species were found within this section.

White terns were seen at four point count stations along this section. Nine white terns were encountered. This low number is consistent with the Vanderwerf 2003 findings, in which the lowest number of white terns was found from November through January, and the highest during the peak breeding period from February to July. White terns were not encountered within any other section of the corridor. Their occurrence in Honolulu is attributed to the presence of large street and park trees where they roost and nest almost exclusively (Vanderwerf 2003). The absence of terns west of Hickam Air Force Base and east of Niu Valley is attributed to the lack of large trees beyond these areas (Vanderwerf 2003).

Vehicle Transect

Seventeen white terns were seen on May 31, 2008 over a 2.25-hour period, and fifteen white terns were seen on June 1, 2008 during a 2.0-hour period. Terns were primarily observed in the downtown area and in Kapiʻolani Regional Park. Although the two survey methods (point counts in 2007 and vehicle transect in 2008) are not statistically comparable, the survey showed that more terns were found in May through June than in December through January.

4.2 Vegetation

4.2.1 Existing Documentation on Protected Species

Based on coordination with the USFWS for previous transit projects, five federally endangered plant species have been observed within the ʻEwa area of the study corridor:

- Koʻoloaʻula (*Abutilon menziesii*)
- ʻAwīwī (*Centaurium sebaeoides*)
- ʻIhiʻihi (*Marsillea villosa*)
- The Maui chaff flower (*Achyranthes splendens spp. rotundata*)
- Skottsberg's broom spurge (*Chamaesyce skottsbergii*)

A Species of Concern, the plant puukaa (*Torulinium odoratum ssp. auriculatum*) has also been reported within the ʻEwa area.

HBMP supplied historical and present locations of known threatened and endangered plant species within the greater study area corridor for review. The only rare plant mapped on or immediately adjacent to the proposed alignment was the koʻoloaʻula (*Abutilon menziesii*) population at the southern end of North-South Road.

Figure 4-1 shows the locations of the koʻoloaʻula plant clusters identified in 2004 and the 18-acre contingency reserve plot. Koʻoloaʻula is protected by both the Federal ESA of 1973, as amended, and HRS Chapter 195D, as amended. Koʻoloaʻula is a shrub of the mallow family that grows 6 to 8 feet tall, with coarsely toothed, silvery, heart-shaped leaves about 1 to 3 inches long. Flowers are medium to dark red and less than 1 inch in diameter. It has been sold as an ornamental plant at local nurseries under the name "Red ʻilima." Other extant populations of koʻoloaʻula

currently exist on Lānaʻi and Maui. An HCP for *Abutilon menziesii* at Kapolei (2004) is in place for this endangered taxa.

The Maui chaff flower, Skottsberg's broomspurge, ʻawīwī, and ʻihiʻihi generally grow in dry forests and could be present on the ʻEwa Plain. There are no HCPs or USFWS Critical Habitat areas related to any of these species. The reasons that these four endangered species are less likely to be present along the study corridor than koʻoloaʻula follow:

- The Maui chaff flower (*Achyranthes splendens spp. rotundata*), a small shrub, is typically found on talus or rocky slopes and on coralline plains with numerous sinkholes. The proposed project alignment would generally traverse farmed or relatively developed areas rather than talus or rocky slopes. The alignment would avoid areas with sinkholes because of their structural instability.
- Skottsberg's broomspurge (*Chamaesyce skottsbergii*), a small shrub, is generally found closer to the coast in drier and sandier areas than the proposed project alignment.
- ʻAwīwī (*Centaurium sebaeoides*), a small herb, is thought to be extinct on Oʻahu. It is generally found on rocky slopes near the coast.
- ʻIhiʻihi (*Marsilea villosa*), a small fern resembling a four-leaf clover, requires periodic flooding for spore release and fertilization, followed by a decrease in water levels for the young plants to establish. It typically occurs in shallow depressions in clay soil or lithified sand dunes overlaid with alluvial clay. This plant is known to occur in areas of Kalaeloa that meet these criteria, but it does not occur in the more developed portion of Kalaeloa where the proposed project alignment is planned.

4.2.2 Results of Fieldwork

The botanical survey and search for any protected, rare, or endangered plant species was conducted along the corridor during January 2008. This section focuses on the ʻEwa Plain area, where relatively undeveloped land is present in the study area. This area includes the portion of the corridor between Kapolei and Aloha Stadium. Vegetation within the ʻEwa Plain study area consists of:

- Ruderal (weedy) patches, such as undeveloped or abandoned properties;
- Plants within abandoned agricultural areas, such as the area makai of the H-1 Freeway near Kapolei; and
- Plantings in cultivated agricultural areas such as the Sumida Watercress Farm (Kalauao Spring) and taro patches at the Waiawa Spring in the Pearlridge/Pearl City areas, and diversified agriculture farms in the ʻEwa Plains.

Vegetation in the more developed portions of the study area, from Aloha Stadium to Waikīkī/UH, consists solely of maintained street plantings such as roadway medians

and shoulders. No native habitat or species are present in this portion of the study corridor. The *Honolulu High-Capacity Transit Corridor Project Street Trees Technical Report* (RTD 2008a) discusses street plantings in detail, both in developed portions of the ‘Ewa Plain and in the eastern developed areas.

The existing vegetation observed along the proposed alignment is discussed below. Table 4-2 includes a complete species list that encompasses all plant species observed within the survey area of the portion of the corridor between Kapolei and Aloha Stadium. It also includes an estimate of native vegetation cover by percentage, and information on vegetation at proposed support facilities (e.g., maintenance and storage, park-and-ride lots, and transit centers). Vegetation types noted during the field survey of the portion of the corridor between Kapolei and Fort Weaver Road are described by section (between each planned station, transit center, or park-and-ride). A portion of the corridor from Aloha Stadium to Waikīkī/UH is urbanized; this section is briefly discussed and included in Table 4-2.

West Kapolei Station to Kapolei Transit Center

The West Kapolei Park-and-Ride and Station area is characterized by buffelgrass (*Cenchrus ciliaris*) scrub with scattered weedy plants such as lion’s ear (*Leonotis nepetifolia*), koa haole (*Leucaena leucocephala*), kiawe (*Prosopis pallida*), castor bean (*Ricinus communis*), and golden crown-beard (*Verbesina encelioides*). Native plant species include ‘ilima (*Sida fallax*) and uhaloa (*Waltheria indica*). Kamokila Boulevard is planted and maintained with street trees and shrubs. The section of the alignment that follows the unbuilt section of the Kapolei Parkway is characterized by a previously graded substrate with a buffelgrass scrub, much like the one at the West Kapolei Station, but with fewer native plant species, most obviously lacking ‘ilima.

Kapolei Transit Center to Kalaeloa Station

The proposed site for the Kapolei Transit Center is characterized by uneven disturbed substrate covered with koa haole scrub dominated by koa haole, kiawe, and castor bean. The section of alignment running south from the transit center to Renton Road is characterized by the same vegetation type. After the alignment crosses Renton Road, the vegetation changes to unmaintained residential plantings including large trees such as earpod tree (*Enterolobium cyclocarpum*), tamarind (*Tamarindus indica*), kou (*Cordia subcordata*), Chinese banyan (*Ficus microcarpa*), African tulip (*Spathodea campanulata*), coconut (*cocos nucifera*), and opiuma (*Pithecellobium dulce*).

Kalaeloa Station to Fort Barrette Road Station

This section of the alignment is characterized by urban plantings from the Kalaeloa Station to Saratoga Avenue. The alignment then crosses Saratoga Avenue at Enterprise Avenue and enters into a kiawe/buffelgrass scrub to the north of Saratoga Avenue at the site of the proposed Fort Barrette Road Station

Table 4-2: Dominant Vegetation in the Study Area

Name of Street or Facility	Environment	Vegetation	Percent Native Cover
Kapolei to Fort Weaver Road			
West Kapolei	Open field	buffelgrass (*Cenchrus ciliaris*) scrub with ‘ilima (*Sida fallax*), uhaloa (*Waltheria indica*), and lion’s ear (*Leonotis nepetifolia*)	10%
Saratoga Avenue/North-South Road	Former Naval Air Station Barbers Point housing, open scrub, and crop lands	Wākea mauka of Roosevelt Ave: kiawe/buffelgrass scrub Kākea makai of Roosevelt Ave: large unmaintained trees including kiawe (*Prosopis pallida*), African tulip (*Spathodea campanulata*), Chinese banyan (*Ficus microcarpa*), earpod (*Enterelobium cyclocarpum*), and opium (*Pithecelobium dulce*); with buffelgrass and passion fruit (*Passiflora edulis*) understory Saratoga Avenue: Mixed scrub with koa haole and ‘ilima North-South Road: koa haole/grassland scrub with ‘ilima and uhaloa	5%
Fort Weaver Road to Aloha Stadium			
Farrington Highway/Kamehameha Highway	Urban towns of Waipahu, Pearl City, Waiawa, and Waimalu; passes Pearl Harbor Park, ‘Aiea State Recreation Area, Sumida Watercress Farm, and several drainage canals	Street plantings; trees include monkeypod, opiuma, macaranga (*Macaranga tanarius*), and java plum (*Syzygium cumini*); scrubs include *Pritchardia sp.* and hibiscus; mowed non-native grass in median strip Stream vegetation along banks dominated by California grass (*Brachiaria mutica*), ivy gourd (*Coccinea grandis*), and honohono grass (*Commelina diffusa*) Waiawa Interchange: Koa haole scrub	<1%
Aloha Stadium to Kalihi			
Salt Lake Boulevard	Residential areas	Street plantings	0%
Aolele Street	Commercial area with drainage channel	Street plantings	0%
Kalihi to University and Waikīkī			
Dillingham Boulevard	Commercial area	Street plantings	0%
Nimitz Highway/Halekauwila Street/ Kapi‘olani Boulevard	Urbanized portion of Honolulu, crosses Nu‘uanu drainage canal	Street plantings	0%
Waikīkī Extension	Residential/Commercial and Resort development, crosses Ala Wai drainage canal	Street plantings	0%
Kapolei to Fort Weaver Road			
West Kapolei Park-and-Ride & Station	Disturbed open grassland/haole koa scrub field	Buffelgrass scrub with ‘ilima	10%
Kapolei Transit Center	Disturbed open weedy scrub and grassland	Koa haole/buffelgrass scrub with verbesina, kiawe, castor bean	1%
Kalaeloa Station	Disturbed kiawe scrub forest	Kiawe forest and buffelgrass scrub with opiuma, koa haole, guinea grass, ficus	1%
Fort Barrette Road Station	Disturbed kiawe scrub forest	Street trees and buffelgrass scrub with kiawe, opiuma, ‘ilima	5%
Kapolei Parkway Station	Disturbed open weedy scrub and grassland	Koa haole/buffelgrass scrub with castor bean	1%
East Kapolei Park-and-Ride	Disturbed open weedy scrub and grassland	Koa haole/buffelgrass scrub with castor bean	1%
East Kapolei Station	Disturbed open weedy scrub and grassland	Koa haole/buffelgrass scrub with castor bean and possible *Abutilon menziesii* plants in proximity	1%
UH West O‘ahu Park-and-Ride & Station	Agriculture fields, corn crops, and fallow fields	Corn and fallow fields	1%
Ho‘opili Station	Fallow agriculture fields	Fallow fields with Guinea grass and buffelgrass	0%
Farrington Highway Maintenance Facility (Aloun Farms Baseyard)	Agriculture fields, corn crops, and fallow fields	Corn and fallow fields	0%
Fort Weaver Road to Aloha Stadium			
West Loch Park-and-Ride	Industrial/parking lot	None	0%
Waiawa Maintenance Facility	Disturbed scrub	Koa Haole scrub with guinea grass, java plum, monkey pod, Antigonon, Pluchea	1%
Pearl Highlands Park-and-Ride (Waiawa)	Waiawa Stream and disturbed scrub	Koa Haole scrub with guinea grass, java plum, California grass, macarnaga	1%
Pearlridge Transit Center	Industrial/parking lot	Street trees and ornamental planting (Hibiscus and Tecoma trees)	0%

Fort Barrette Road Station to Kapolei Parkway Station

Kiawe/buffelgrass scrub continues for 700 feet east from Fort Barrette Road Station to Midway. The alignment along Independence Road is dominated by mature Chinese banyan (*Ficus microcarpa*) with smaller kiawe trees and buffelgrass understory. Once the alignment crosses Coral Sea Road, the vegetation changes to an open scrub with a mixed coral substrate. Vegetation included species such as ‘ilima, sourbush (*Pluchea carolinensis*), Mexican creeper (*Antigonon leptopus*), uhaloa (*Waltheria indica*), and blue vitex (*Vitex trifolia*). Larger trees such as monkeypod (*Samanea saman*) and opium (*Pithecellobium dulce*) are scattered throughout the section and kauna‘oa pehu (*Cassytha filiformis*), an indigenous parasitic liana, is draped in many of the trees. As the alignment turns north toward the Kapolei Parkway Station, vegetation is dominated by a buffelgrass scrub crossing Vinson Road and Roosevelt Avenue.

Kapolei Parkway Station to East Kapolei Station

This section of the alignment follows to the west of the future North-South Road. Most of this area is freshly graded, currently bare ground. Vegetation increases as the alignment moves north toward Kalo‘i gulch, where it crosses and turns east toward the proposed East Kapolei Station. Vegetation is dominated by a buffelgrass scrubland that increases in density at the Kalo‘i Gulch crossing. Although several ko‘oloa‘ula (*Abutilon menziesii)* plants were observed, they were adjacent to the alignment and outside the immediate survey transect. The 12-acre park-and-ride site is known to contain ko‘oloa‘ula according to the HCP for this species (Ohashi 2004), and will require a detailed survey with all corners staked prior to construction. Any plants found would be transplanted to the 18-acre contingency reserve.

East Kapolei Station to Ho‘opili Station (including UH West O‘ahu Park-and-Ride)

The majority of this parcel is under cultivation or cleared to bare soil. Crops observed growing in this area include corn, melons (*Cucumis sp.*), basil (*Ocimum sp.*), and bananas (*Musa sp.*). At the edges of planted areas and in fallow fields, weedy species such as kili *‘o‘*opu (*cyperus rotundus*), wild spider flower (*Cleome gynandra*), and cheeseweed (*Malva parviflora*) were observed. Several flumes run east-west through the property, and these have a greater number of plant species due to the availability of water. The flumes are dominated by koa haole and guinea grass, with other non-native plant species scattered within the site that include boerhavia (*Boerhavia coccinea*), Australian saltbush (*Atriplex semibaccata*), heliotrope (*Heliotropium procumbens*), coat buttons (*Tridax procumbens*), and slender mimosa (*Desmanthus pernambucans*). Along the flumes, there are some larger woody species such as Christmas berry (*Schinus terebinthifolius*), fleabane (*Pluchea* x *fosbergii*), Chinese banyan (*Ficus microcarpa*), and a few mango (*Mangifera indica*) trees. The only indigenous plant species observed within the site are uncommon and include: ‘ilima and scattered individuals of popolo (*Solanum americanum*) and uhaloa (*Waltheria indica*).

Ho‘opili Station to West Loch Station (Farrington Highway)

In this area, vegetation at the edges of fields and along roadsides consisted of generally low-growing weedy shrubs dominated by koa haole, Christmas berry (*Schinus terebinthifolius*), sourbush (*Pluchea carolinensis*), castor bean, and guinea grass. Along Farrington Highway, vegetation is dominated by non-native grass species with kiawe and monkeypod (*Samanea saman*) trees and bougainvillea (*Bougainvillea sp.*) scattered along the length of the parcel.

Honouliuli Gulch runs north-south through this section of the alignment. Several tall tree species reside in the gulch, including kukui (*Aleurites moluccana*), kiawe, pride of India (*Melia azerdarach*), and autograph tree (*Clusia rosea*). The bottom of the gulch has been cleared for a banana patch that is currently in cultivation. At the lowest point of the gulch where it crosses Farrington Highway, several morning-glory species were observed, including koali ai (*Ipomoea cairica*), little bell (*I. Triloba*), and *I. obscura*. Primrose willow (*Ludwigia octovalvis*), love-in-a-mist (*Passiflora foetida*), and comb hyptis (*Hyptis pectinata*) were observed in drainage areas.

Farrington Highway Maintenance and Storage Facility (Aloun Farms Baseyard)

The Aloun baseyard is planted with various cultivars including citrus (*Citrus sp.*), noni (*Morinda citrifolia*), kalo (*Colocasia esculenta*), yellow Poinciana (*Peltophorum pterocarpum*), sugar cane (*Saccharum officinarum*), and lemon grass (*Cymbopogon citratus*). The electric power substation has a hedge of tropical coral tree (*Erythrina variegata*) planted along the fence line. As shown in Table 4-2 and Table 4-3, the maximum native cover observed in the ‘Ewa Plain was 10 percent. This illustrates that most areas are substantially disturbed and dominated by non-native grasses, shrubs, and trees. Native species observed during the survey included:

- ‘Ilima (*Sida fallax*)
- Uhaloa (*Waltheria indica*)
- Ko‘oloa‘ula (*Abutilon menziesii*) (outside of immediate alignment as shown on Figure 4-1)
- Kauna‘oa pehu (*Cassytha filiformis*)
- Kipukai (*Heliotropium curassavicum*)
- Popolo (*Solanum americanum*)

‘Ilima, uhaloa, kauna‘oa pehu, kipukai, and popolo are not considered threatened or endangered. As mentioned previously, ko‘oloa‘ula is protected by both the Federal ESA of 1973, as amended, and Chapter 195D, HRS, as amended.

As part of environmental planning for North-South Road and a portion of Kapolei Parkway, an HCP for ko‘oloa‘ula (*Abutilon menziesii*) at Kapolei was finalized in March 2004 and is phased over a 20-year period. The HCP describes impacts that assume the population would be incrementally taken or destroyed as development in the area of North-South Road and surrounding developments are implemented. Mitigation measures have been specified for this population of ko‘oloa‘ula, related to

the construction of the North-South Road and other developments. One of the measures has established an 18-acre contingency reserve that includes the largest number of plant individuals. The reserve would need to remain in situ until other HCP success criteria are met; the criteria are dependent on qualitative and quantitative success and the reserve duration is unspecified.

Future construction on this portion of the proposed guideway, transit center, and park-and-ride lot would be in proximity to the 18-acre contingency reserve. Construction may result in possible shading of the population and secondary disturbance due to dust and debris from construction.

4.3 Wetlands

4.3.1 Wetlands/Streams Resources

Many streams are located within the study corridor. Most of these stream channels have been altered in the lower reaches and are not of high ecological quality. Overall water quality in these urban streams is poor, and many are included on the State of Hawaiʻi Department of Health's (HDOH) 303(d) List of Impaired Waters.

The Hawaiian Islands have many wetlands and wetland habitats. On Oʻahu, perennial and intermittent streams originating in the higher elevations of the Koʻolau and Waiʻanae Mountains represent a major "riverine" or stream wetland system.

Wetland complexes within the study area from Kapolei (to the west) to Waikīkī (to the east) are associated with riverine, tidal, and spring systems in three areas: Pearl Harbor, Salt Lake, and Waikīkī. Over time, land development has altered or destroyed most of these wetlands, leaving only a few remnants. All streams within low-lying areas, and especially at road crossings, have been altered through channelization, lining, dredging, or other alteration (COWRM 1990). Figure 4-1 through Figure 4-4 depict water resources within the study area.

Field investigation of wetlands along the proposed alignment was conducted in December 2007 and January 2008. Table 4-3 lists numerous stream crossings throughout the study area and identifies those with characteristics that indicate possible wetlands. These characteristics include the presence of water (hydrology), hydrophytic vegetation, and hydric soils. Descriptions of soil types are from the National Resource Conservation Service (NRCS 2008). Classification of wetlands is based on *Classification of Wetlands and Deepwater Habitats* (Cowardin 1979).

Only a few areas within the study area that are not directly connected to riverine systems are believed to be wetlands that meet the three criteria of hydrology, hydrophytic vegetation, and hydric soils. These are primarily sites associated with natural springs in the Pearl Harbor area and are identified as the Waiau Spring pond and the Kalauao Spring (Sumida Watercress Farm). Inspection of streams was limited to the location of specific crossings.

4.3.2 Results of Fieldwork

The survey results are summarized in Table 4-3. A general overview is provided in the following sections.

Kapolei to Fort Weaver Road

The soils that comprise the study corridor in the dry ‘Ewa Plain are predominantly from the Lualualei and ‘Ewa Series, which are well-drained (non-hydric) soils in coastal plains, basins, and on alluvial fans. Several gulches that originate on the slopes of the Wai‘anae Mountain range form drainages that intermittently cross the various proposed alignment alternatives.

Generally, these gulches do not exhibit clear indicators of wetlands, and a recent determination by USACE is that Kalo‘i Gulch and its tributaries with no ocean outlet will not be regulated by USACE. The intermittent Honouliuli Gulch, like Kalo‘i Gulch, has been breached, channelized, or rerouted into culverts at several locations along its alignment. However, because its discharge point is at the West Loch of Pearl Harbor, portions of this stream may be classified as regulatory waters.

Fort Weaver Road to Aloha Stadium

In this section of Farrington and Kamehameha Highways, several streams discharge into Pearl Harbor. Waikele, Waiawa, Waimalu, Kalauao, and ‘Aiea Streams are designated as perennial streams. Hō‘ae‘ae, Kapakahi, Makalena, and Waiau Streams are intermittent streams.

Pū‘ōhala Marsh, located between Waikele and Kapakahi Streams in Waipahu, is a 70-acre coastal wetland that has been identified as a core habitat for Hawai‘i’s endangered waterbirds, migratory shorebirds, and waterfowl. Pū‘ōhala Marsh is about 0.25 mile south from Farrington Highway.

Two spring-fed wetlands were identified adjacent to Kamehameha Highway: a small pond associated with Waiau Spring, and the Sumida Watercress Farm associated with Kalauao Spring. A third spring, Waiawa Spring, is approximately 1,000 feet southeast of the proposed Leeward maintenance and storage facility.

The Waiau Spring ponds were previously more extensive and spanned the area mauka and makai of Kamehameha Highway. Soils are mapped as Tropaquepts (TR), a hydric soil. Tropaquepts are poorly drained soils that are flooded and used for production of water-dependent crops such as taro, rice, and watercress. The land adjacent to the east of the pond consists of Hanalei silty clay (HnB), another hydric soil. Functions and values of this wetland include water storage, water purification, and habitat for waterbirds and shorebirds. The proposed guideway would be adjacent to the Waiau Spring for a distance of approximately 300 feet. There is an approximately 15-foot to 20-foot upland buffer from the mauka edge of the highway. The adjacent area surrounding the wetland is developed with residential housing.

Table 4-3: Wetlands/Waters Existing Conditions

Waterbody	Hydrology	Channels/Soils	Vegetation	Wetlands Classification	Functions	Values
Kapolei to Fort Weaver Road						
Flume at park-and-ride	Dry	Dirt (covered with rusting metal liner)	Non-hydrophytic	Not wetland	Defunct irrigation facility	
Unnamed drainage at Kapolei Parkway/Kalaeloa Boulevard	Wet	Man-made drainage, concrete sides extending from concrete culvert	Hydrophytic	Not wetland	Drainage	
Kalo'i Gulch at North-South Road	Dry	Natural drainage	Non-hydrophytic	Not wetland (No USACE jurisdiction)	Drainage	
Honouliuli Stream at Fort Weaver Road	Dry	Concrete culvert	No vegetation	Riverine	Drainage	
Fort Weaver Road to Aloha Stadium						
Hō'ae'ae Stream at Farrington Highway	Dry	Concrete channel	Hydrophytic	Riverine	Drainage	
Waikele Stream at Farrington Highway	Perennial stream	Concrete channel	No vegetation	Riverine	Drainage	
Kapakahi Stream at Farrington Highway	Flowing	Natural drainage	Hydrophytic	Riverine	Drainage	
Makalena Stream at Farrington Highway	Flowing	Concrete channel	No vegetation	Riverine	Drainage	
Waiawa Stream at Farrington Highway	Perennial stream	Natural drainage	Hydrophytic	Riverine	Drainage	
Pearl Highlands Park-and-Ride location at Waiawa Stream	No hydrology observed	KIA – Kawaihapa clay loam (non-hydric) Appears to have top layer of fill material	Non-hydrophytic	Floodplain from Waiawa Stream	(Current land uses: residential and baseyard)	
Waiau Stream at Kamehameha Highway	Flowing	Natural drainage	Hydrophytic	Riverine	Drainage	
Waiau Spring at Kamehameha Highway (mauka of HECO power plant)	Surface water source: Waiau Spring	Saturated soil TR – Tropaquepts (hydric) HnB – Hanalei silty clay (hydric)	Hydrophytic	Palustrine	Agricultural, water storage, water purification, wildlife habitat	Aesthetic, cultural
Waimalu Stream at Kamehameha Highway	Perennial stream	Natural drainage	Hydrophytic	Riverine	Drainage	
Sumida Watercress Farm (Kalauao Spring) at Kamehameha Highway	Surface water source: Kalauao Spring	Saturated soil Ph – Pearl Harbor (hydric)	Hydrophytic	Wet agricultural field	Agricultural, water storage, water purification, wildlife habitat	Waterbird watching, cultural
Kalauao Stream at Kamehameha Highway	Perennial stream	Natural drainage	Hydrophytic	Riverine	Drainage	
'Aiea Stream at Kamehameha Highway	Perennial stream	Natural drainage	Hydrophytic	Riverine	Drainage	
Waipahu Canal	Flowing	Concrete channel	No vegetation	Riverine	Drainage	
Aloha Stadium to Kalihi						
Hālawa Stream at Salt Lake Boulevard	Perennial stream	Concrete channel	No vegetation	Riverine	Drainage	
Moanalua Stream at Fort Shafter Flats	Perennial stream	Natural drainage	Hydrophytic on banks	Riverine	Drainage	Fishing, recreation
Moanalua Stream at Nimitz Highway	Perennial stream	Natural drainage	Hydrophytic on banks	Riverine	Drainage	Fishing, recreation
Hālawa Stream at Kamehameha Highway	Perennial stream	Concrete channel	No vegetation	Riverine	Drainage	
Drainage ditch parallel Aolele Street	Surface water	Saturated Kea'au stony clay (KmaB) - hydric	Hydrophytic	Man-made channel	Localized drainage sump	
Kalihi to UH Mānoa						
Kalihi Stream at Dillingham Boulevard	Perennial stream	Natural drainage	Non-hydrophytic	Riverine	Drainage	
Kapālama Canal at Dillingham Boulevard	Perennial stream	Concrete channel	No vegetation	Riverine	Drainage	
Ala Wai Canal tributaries (two) at Kapi'olani Boulevard	Surface runoff	Concrete	No vegetation	Probably not wetlands	Drainage	
Ala Wai Canal at Kalākaua Avenue	Perennial stream	Channelized drainage	No vegetation	Riverine	Drainage	Recreation, aesthetic

The Sumida Watercress Farm is hydrologically linked to the Kalauao Spring approximately 900 feet north of the highway. Soils are mapped as Pearl Harbor (Ph), a hydric soil. Pearl Harbor soils are very poorly drained and occur on nearly level coastal plains. Historically, this land has been used for wet agricultural fields since the early Hawaiians cultivated taro at Kalauao. Rice was subsequently grown, and watercress since 1928. In addition to having agricultural value, this wetland serves a water storage and purification function and as habitat for waterbirds and shorebirds. Drainage flows from the watercress farm are through culverts under Kamehameha Highway. The proposed guideway would be adjacent to the watercress farm for a distance of approximately 530 feet.

The proposed park-and-ride location at the Waiawa Interchange is in a flood zone, and large areas have been filled over time for residential uses. Structures are raised to accommodate floods. The ‘Ewa side of the site is a parking baseyard for large construction vehicles. The soils in this area are identified as Kawaihapai clay loam, 0 to 2 percent slopes (KIA). The Kawaihapai Series consists of well-drained soils in drainageways and alluvial fans on the coastal plains. The NRCS does not consider this soil to be “hydric.” The stream banks are dominated by California grass (*Brachiaria mutica*), and honohono grass (*Commelina diffusa*), both hydrophytic plants. Trees include monkeypod, opiuma, macaranga (*Macaranga tanarius*), and java plum (*Syzygium cumini*). The drier areas are dominated by koa haole scrub, and guinea grass (*Panicum maximum*) is also present.

Aloha Stadium to Kalihi

Both the Salt Lake Alternative and the Airport Alternative would cross Hālawa Stream and Moanalua Stream. Hālawa Stream is a concrete-lined drainage channel where both alternatives would cross it, so it is not further discussed in this report. Moanalua Stream is channelized but not concrete lined and has vegetation along its banks. Fishes observed in Moanalua Stream at the time of the survey included: tilapia (*Tilapia* sp.), mullet (*Mugil cephalus*), aholehole (*Kuhlia* sp.), barracuda (*Sphyraena* sp.), papio (Carangidae), milkfish (*Chanos chanos*), and a‘ama crab (*Grapsus tenuicrustatus*).

Salt Lake Alternative

Natural wetlands are present in the basin of the Salt Lake area to the north of the study area. However, along Salt Lake Boulevard, which is higher in elevation, water sources are lacking and soils are mapped as Makalapa Series (MdD, MdB), Fill Land (FL), and Rock land (rRK). None of these soils types are listed on the NRCS hydric soils list, nor are there stream crossings in the vicinity.

The Salt Lake Alternative’s alignment would traverse and run alongside Moanalua Stream in areas not presently crossed by any existing bridges, so the following description is provided.

The segment of Moanalua Stream along which the Salt Lake Alternative alignment would run is in the Māpunapuna/Fort Shafter Flats area. Land uses in the area

consist of a mixture of military, commercial, and industrial uses. The Moanalua Stream channel in this area is a tidal drainage. There are concrete-rubble masonry (CRM) embankments, mixed with naturally sloping muddy banks along the stream. The bottom is unconsolidated and has been dredged and channelized.

This alternative's alignment would cross the stream approximately 1,000 feet downstream of Kikowaena Street Bridge to the east side of Moanalua Stream, and follow along an existing mixed gravel fill and asphalt paved path parallel to the stream bank. The alignment would then cross at the mouth of Kahauiki Tributary before turning east into an industrial parking lot. The streambank along the west side of the stream, where it would cross, is CRM concrete with vegetation growing at the top of the bank. Trees such as kiawe and milo, along with grasses and shrubs such as California grass, natal red-top, swollen fingergrass, koa haole, and Indian fleabane characterize the vegetation. The east side of the bank where the alignment would continue is also CRM concrete with a few large kiawe trees (15 to 20 feet tall) and a pickleweed understory. Vegetation along the bank toward Kahauiki Tributary changes as the CRM ends, and a natural muddy bank harbors a thick stand of red mangrove. The upper bank is more diverse, with scattered kiawe and ironwood trees (20 feet tall) and understory shrubs such as bluemink, false daisy, sourbush, and buffelgrass. The banks of Kahauiki Tributary where the alignment would cross are a mix of mud and coral fill with an average depth of 4 feet. The muddy lower banks harbor germinating red mangrove plants, with grass and shrub species such as sprangletop, beggar tick, and kipukai growing in the upper bank of coral fill. The adjacent floodplain is comprised of FL soil and serves a recreational purpose, with ball fields and a 10-foot paved jogging/maintenance road parallel to the stream.

Airport Alternative

The areas both mauka and makai of the Nimitz Highway viaduct consists of soils in the Makalapa Series (MdB), a non-hydric soil. A band of Kea‘au Series soil (KmaB), a poorly drained hydric soil is mapped by NRCS along Aolele Street, which correlates with a drainage ditch paralleling the street. The ditch discharges into Ke‘ehi Lagoon to the east.

The Airport Alternative alignment would cross Moanalua Stream just makai of the Nimitz Highway viaduct. The banks of Moanalua Stream where the alignment would cross are a mix of mud and coral fill. The muddy lower banks harbor germinating red mangrove plants, with grass and shrub species such as sprangletop, beggar tick, and kipukai growing in the upper bank of coral fill. The adjacent floodplain is comprised of FL soil and serves recreational purposes, with a park and paint-ball course nearby.

Kalihi to University and Waikīkī

Dillingham Boulevard

Similar to the crossing on North King Street, Kapālama Canal at Dillingham Boulevard is flanked by Ph hydric soils on the north. Other dominant soils surrounding Kapālama Canal include FL.

In this section, the mouth of Nuʻuanu Stream is highly channelized where it discharges to Honolulu Harbor. The surrounding land is comprised of fill at all crossings of this stream at Beretania Street, Hotel Street, and Nimitz Highway.

Kapiʻolani Boulevard crosses two constructed Ala Wai Canal tributaries, which provide drainage for the surrounding urbanized areas. Those surrounding lands are fill and ʻEwa Series soils (EmA).

Waikīkī Extension

Historically, the Waikīkī land area surrounding the Ala Wai Canal was marshland until its reclamation in the 1920s. The 2.5-mile long, 160 to 260-foot-wide canal was excavated from the coral substrate, which was side cast to fill the extensive marshes previously farmed as taro and rice fields. Much of present-day Waikīkī rests on material created by the original excavation of the canal. The primary sources of water are the perennial Mānoa and Pālolo Streams. Secondary sources are two tributary canals that collect surface runoff. At the Kalākaua Avenue crossing, the canal appears to have a natural earthen substrate. This flood control project is also a major recreational venue for canoe paddling and other small water craft.

4.3.3 Stream Biota

The first comprehensive biological surveys of Pearl Harbor's freshwater springs, wetlands, and estuarine areas revealed an ecologically degraded fauna dominated by introduced species (Englund 2000a). The lower portions of Pearl Harbor streams, springs, and wetlands are now dominated both in total biomass and total numbers by introduced species (Englund 2000a). The large Pearl Harbor spring complex, including Kalauao and Waiawa Springs, was found to have low salinity levels and was almost entirely dominated by extremely high densities of introduced fish such as blackchin tilapia (*Sarotherodon melanotheron*) and live bearers. Along the Waimano Springs complex, the Waikele Springs area was completely freshwater, and nonnative fish species were observed in these areas. The endemic *ʻoʻopu nakea* (*Awaous guamensis*) was uncommon, but present in Waikele and Waimalu Streams. Pūʻōhala Marsh, located between Waikele and Kapakahi Streams in Waipahu, is a 70-acre coastal wetland that has been identified as of critical importance to Hawaiʻi's endangered waterbirds.

The lower stream reaches and estuaries of the south shore of Oʻahu represent some of the most disturbed aquatic and estuarine habitats found in the Hawaiian Islands (Englund 2000b). One of the major findings of past biological surveys was a direct correlation of native species predominating as the environment became more marine in character. Surveys also found that many native aquatic species have been displaced in the lower reaches of freshwater systems along the south shore of Oʻahu. The loss of a major group of native aquatic insects such as the Megalagrion damselflies and native aquatic saldids, the near absence of freshwater mollusks, the scarcity of native fish such as the *ʻoʻopu nakea*, and the absence or near absence of the *ʻoʻopu alamoo* (*Lentipes concolor*) and *ʻOʻopu nopili* (*Sicyopterus stimpsoni*) in the lower stream reaches are evidence of this decline (Englund 2000b).

The native goby species *‘O‘*opu nakea was uncommon and only found in Nu‘uanu Stream. One post-larval *‘O‘*opu nopili was also collected in Nu‘uanu Stream. The *‘o‘*opu nopili is listed by the AFS as a Species of Special Concern. The near absence of this species and Lentipes concolor (another native freshwater goby sensitive to disturbance in the lowest areas of south and west shore O‘ahu streams) indicates that these habitats have been heavily impacted by a combination of habitat alterations and introductions and nonindigenous species (Englund 2000b)

It is probable that native *‘o‘*opu (Gobidae) also occur in the stream. *‘O‘opu* have an amphidromous life cycle: they migrate to and from the sea but do not use the ocean for reproduction. *‘O‘opu* spend their entire adult lives in freshwater streams. They reproduce in the stream, laying their eggs on the upper surfaces of rocks, which hatch within 48 hours. Larvae then drift out to the ocean and spend up to 160 days in a planktonic state. Returning post-larval *‘o‘opu*, called *hinana*, may ascend randomly to streams and at times in great numbers.

‘O‘opu hi‘ukole (*Lentipes concolor*) was listed as a candidate species on the Federal Register and considered threatened by the AFS. ‘O‘opu nakea and ‘o‘opu nopili (*Sicyopterus stimpsoni)* were considered to be Species of Special Concern by the AFS.

The Project would have no effect on any threatened, endangered, or protected species or designated habitat of such species. In only one case, *Abutilon menziesii*, a threatened vegetation species also known as ko‘oloa‘ula or red ‘ilima, is any mitigation necessary to reach this determination.

5.1 Wildlife

Urban environments in Hawai‘i provide habitat for some wildlife species that are adapted to the human environment. Farmland and dry lowland forest or shrub plant communities provide more diverse wildlife habitat, but are very limited in the study corridor except in the ‘Ewa area (Kapolei to Fort Weaver Road). Only some sites proposed for maintenance, storage, and other facilities provide this type of habitat, which would be disturbed and eliminated by the facilities required for the Project. Construction that would alter kiawe woodlands and open fields would have a lasting effect on birds such as francolins, pheasants, mockingbirds, and barn owls, which would not adapt to urbanization.

The Project would not affect wetland sites such as spring-fed wetlands along the route because with few exceptions, the proposed corridor would use existing roadways. There may be temporary disturbance of endangered and protected waterbirds when construction activities are in proximity to some of the spring-fed wetland sites, in particular the Sumida Watercress Farm (Kalauao Spring) and Waiau Spring. However, construction is anticipated to be no more than a minor distraction to these birds because they continue to inhabit these wetlands even though they are adjacent to highways that are heavily traveled by vehicles, trucks, and buses, and even though the general area has gradually become more densely developed. Over time, the waterbirds are expected to adjust to new structures built for the Project. Construction activities over Moanalua Stream may temporarily affect the availability of foraging sites for black-crowned night herons, but this species is highly adaptable to altered environments and would adapt to new structures built over the stream.

White terns almost exclusively use mature canopy trees as roosting and nesting sites. A small number of these trees would be affected by pruning or removal. Many other mature trees are near the proposed alignment, so no long-term consequences to tern roosting or nesting would occur.

5.2 Vegetation

Vegetation near the alignment in the ‘Ewa Plain consists of ruderal (weedy) patches, haole koa scrub, and kiawe woodlands on undeveloped or abandoned properties in Kalaeloa and agricultural areas. These include diversified agriculture farms makai of the H-1 Freeway near Kapolei.

From Fort Weaver Road to Aloha Stadium in Pearl City and ‘Aiea, there are watercress farms and taro patches where perennial springs are present.

The native habitat in all sections of the proposed alignments in the Kapolei and Pearl City areas have been altered and/or modified for agricultural, military, or urban purposes. There are no intact native vegetation types remaining within the study corridor and few native plant species are still extant within the alignments.

Vegetation in the more developed portions of the study corridor east of Aloha Stadium (Aloha Stadium to Kalihi and Kalihi to University/Waikīkī) consists solely of maintained street plantings, such as roadway medians and shoulders. No native botanical habitat or plant species are present in the more developed areas east of Aloha Stadium.

The endangered ko‘oloa‘ula has been observed in the study area along the North-South Road and is the subject of an approved HCP. This species was not found in the present survey of the corridor, but the guideway and a proposed transit center and park-and-ride would all be in proximity to known extant plant clusters and within approximately 200 feet of the north border of the established 18-acre contingency reserve. If unmitigated, construction effects could directly and adversely affect the individuals in the reserve. Accidental fires caused by construction vehicles and equipment could potentially destroy plants and create excessive dust over time, hampering plant growth.

Shading from the fixed guideway is expected to have a minimal effect on vegetation along the alignment. Shading may alter the species composition of weedy plant species along the alignment, but should not have a negative effect on native plants found along the route. Agricultural areas that are expected to remain after the fixed guideway is built, such as the Sumida Watercress Farm, may experience slight changes in crop growth or health. The shading created by the guideway and cars are expected to be minimal. However to quantify the true effects of shading, a longer-term study with cooperation from the farm owner would be needed.

The greatest effects on vegetation would be during construction, when large equipment would be used to move and grade earth and clear areas for the footprints needed for stabilizing large cranes, etc. Most weedy species found in these areas can be expected to return after damage or removal during the construction phase.

5.3 Wetlands and Streams

The study corridor encompasses a highly urbanized area. Consequently, many streams, wetlands, and aquatic resources have been altered or disturbed by past and ongoing development. Although these disturbances have in many cases diminished the functions and values of the aquatic resources, the streams and wetlands that remain are important ecological resources.

Most of the proposed guideway, stations, and transit facilities are planned within existing roadway corridors and on non-wetlands. Where the elevated guideway would cross streams, the engineering conceptual plan anticipates spanning over

streams that are 150 feet or less in width. Streams that are over 150 feet wide may require in-water piers to support the guideway. These include Waimalu Stream (140 feet), Hālawa Stream (225 feet), Moanalua Stream at Nimitz Highway (270 feet), and Ala Wai Canal (160 feet). An in-water supporting pier with a diameter of 6 to 10 feet maybe required to span these streams. Impacts to streams are discussed in more detail in the *Honolulu High-Capacity Transit Corridor Project Water Resources Technical Report* (RTD 2008b).

One major spring-fed wetland system in Kalauao (Sumida Watercress Farm) and an unutilized spring-fed wetland at Waiau are located adjacent to the study corridor. Placement of the guideway structure within the median of Kamehameha Highway would not cause a direct impact to these wetlands, but shadows cast by the elevated structure may slight affect water temperatures and affect watercress growth. These consequences are anticipated to be very slight to non-existent, based on the proposed guideway's distance from open water and watercress farming areas. Shade would only reach open water and watercress in the late afternoon.

6 Mitigation

6.1 Wildlife

As discussed in the Water Resources Technical Report (RTD 2008b), existing spring-fed wetlands would be protected by a buffer zone during construction. These wetlands include Sumida Watercress Farm and Kalauao and Waiau Springs,

Prior to construction, a wildlife biologist would survey the mature large canopy trees Diamond Head of Hickam Air Force to ensure that none have nesting birds or chicks. If any are found, construction could be delayed until chicks fledge. The mitigation measures identified in the Street Trees Technical Report (RTD 2008a) would help maintain bird habitat.

Maintenance plans for large street trees near the study corridor would need to consider the potential presence of roosting or nesting white terns. In areas of urban Honolulu east of Hickam Air Force Base where mature street trees provide ideal nesting habitat for this State-listed threatened species, it is recommended that tree trimming or removal be conducted during fall and early winter when fewer white terns are present or nesting.

6.2 Vegetation

As part of environmental planning for the North-South Road, a HCP for koʻoloaʻula (Ohashi 2004) was completed and an ITL was issued by DLNR to HDOT. The HCP has specified mitigation measures for the extant population that occurs in the study area.

The proposed guideway alignment, a potential transit center, and a potential park-and-ride would be located near the extant koʻoloaʻula population, specifically the 18-acre contingency reserve.

The Project would require consultation with DLNR-DOFAW and the HDOT to obtain a Certificate of Inclusion, which would stipulate the following:

- HDOT will be the holder of the ITL. The ITL enables the removal of the Kapolei plants to the contingency reserve.
- Other agencies that propose to develop projects at the Kapolei property may have the protection of the ITL by obtaining a fully executed Certificate of Inclusion and filing this document with DLNR.
- HDOT, in consultation with DLNR, may require that other agencies contribute various resources to sustain the HCP's mitigation effort.

Following receipt of the Certificate of Inclusion and prior to grading, the DLNR-DOFAW State botanist would be notified and a search would be conducted within the disturbance area for any extant individual plants. If any plants are found, a DLNR-DOFAW horticulturist would transplant them to the 18-acre contingency

reserve. The soil around mature plants that have gone through the flowering and fruiting cycle would be collected and deposited at the reserve or at other identified out-plant sites. At the discretion of the State botanist, it could also be taken to the Lyon Arboretum Seed Bank.

Construction period mitigation measures would include the need to erect high-visibility construction barriers. These barriers would create fire control buffers between the study area and the 18-acre contingency reserve. Regular maintenance of vehicles and heavy equipment would also help prevent fires. Stationing of water pumping trucks for dust control would reduce dust settling on plants and serve to control fire breakouts.

6.3 Wetlands and Streams

Mitigation for adverse environmental effects on wetlands and streams must consider avoidance and minimization. Practicable alternatives that avoid and minimize adverse effects must also be evaluated.

Because the Project would avoid all wetlands in the study corridor, no effects on wetlands are anticipated and no mitigation would be necessary.

If columns are placed within streams in order to span them, DA Permits Section 10 and Section 404 and their associated State permit(s) would be acquired. These permits generally require mitigation, which could include items related to water quality and measures for aquatic species such as *ʻoʻopu*. USACE would evaluate the application and issue an Individual Permit or a Nationwide Permit. Applicable Nationwide Permits include No. 14 for Linear Transportation Projects, No. 15 for U.S. Coast Guard Approved Bridges, and No. 33 for Temporary Construction, Access, and Dewatering.

Several documents provide direction on the general policy of creating no net loss of functions and values, including:

- USACE Honolulu District, Public Notice No. 200400448 (February 14, 2005): *Honolulu District Compensatory Mitigation and Monitoring Guidelines*
- USACE Regulatory Guidance Letter No. 02-2 (December 24, 2002): *Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the CWA and Section 10 of the RHA*
- USACE Regulatory Guidance Letter 06-03 (August 3, 2006): *Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Creation, Restoration, and/or Enhancement of Aquatic Resources*

Conceptually, a construction buffer of 20 feet from the top of a stream bank (or the ordinary high water line for non-tidal streams and the mean high tide for tidal streams) is recommended for all waters, including wetlands.

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Appendix A
Agency Consultation Letters

USFWS Letter Dated April 29, 2008

NOAA/FS Letter Dated April 14, 2008

DLNR-DOFAW Letter Dated April 2, 2008

DA Letter Dated April 10, 2007

DLNR-DAR Letter Dated May 1, 2006

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

RECEIVED
APR 30 2008
APR 29 2008

In Reply Refer To:
2008-SL-0163

Mr. Darrell Sommerlatt
Environmental Scientist
Parsons Brinckerhoff, Incorporated
1001 Bishop Street, Suite 2400
Honolulu, Hawaii 96813

Subject: Species List Request for Honolulu High Capacity Transit Corridor Project Island of Oahu

Dear Mr. Sommerlatt:

Thank you for your letter dated March 25, 2008, received April 1, 2008, requesting information regarding threatened and endangered species and designated critical habitat that may occur within the proposed project location. The City and County of Honolulu, Department of Transportation Services (DTS), in cooperation with the Federal Transit Administration (FTA), have proposed to construct a public transit system with associated infrastructure through a 23-mile travel corridor between Kapolei and the University of Hawaii at Manoa which may include an extension to Waikiki.

We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program. The federally endangered Kooloaula (*Abutilon menziesii*), Hawaiian hoary bat (*Lasirus cinereus semotus*), Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian coot (*Fulica alai*), Hawaiian stilt (*Himantopus mexicanus knudseni*) and Hawaiian Duck (*Anas wyvilliana*) have been observed in the vicinity of the proposed transit corridor. No federally proposed or designated critical habitats occur within the proposed project area.

The proposed activities of the transit corridor are occupied by a population of *Abutilon menziesii*. The State of Hawaii Habitat Conservation Plan for *A. menziesii* at Kapolei of March 2004, and the U.S. Fish and Wildlife Service (Service) Biological Opinion issued by our office on August 5, 2004 (1-2-2004-F-123), outlines conservation measures for *A. menziesii*. The development of the property has been taken into account in the Service's Biological Opinion. However, the DTS or the FTA will have to obtain the Certificate of Inclusion from Hawaii Department of Transportation. The DTS (and any subsequent landowners who agree to accept transfer of the Certificate of Inclusion) must agree to and implement the terms of the plan.

TAKE PRIDE® IN AMERICA

We appreciate your efforts to conserve endangered species. If you have questions, please contact Aaron Nadig, Fish and Wildlife Biologist, Consultation and Technical Assistance Program (phone: 808-792-9466; fax: 808-792-9581).

Sincerely,

for Patrick Leonard
Field Supervisor

cc:
City and County of Honolulu Department of Transportation Services
Hawaii DOFAW

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4700
(808) 944-2200 • Fax (808) 973-2941

APR 14 2008

APR 16 2008

Mr. Darrell Sommerlatt
Environmental Scientist
Parsons Brinckerhoff, Inc.
American Savings Bank Tower
1001 Bishop Street, Suite 2400
Honolulu, HI 96813

Dear Mr. Sommerlatt:

This letter responds to your March 26, 2008 letter regarding the proposed public transit improvements in a 23-mile travel corridor between Kapolei and the University of Hawaii at Manoa, and possibly to Waikiki, received by the National Marine Fisheries Service (NMFS) Pacific Islands Regional Office (PIRO) on April 1, 2008. In your letter, you requested information on marine listed species and their designated critical habitats, as well as proposed and candidate species, and proposed critical habitat, that may occur within the proposed action area. We provide the following information under our statutory authorities under the Endangered Species Act of 1973 (ESA), as amended [16 U.S.C. §1531 *et seq.*] and the Marine Mammal Protection Act of 1972, as amended [16 U.S.C. 1361 *et seq.*].

Your letter stated that the City and County of Honolulu, Department of Transportation Services (DTS), in cooperation with the Federal Transit Administration, is proposing the transit improvements. Parsons Brinckerhoff, Inc., who is assisting DTS with this project, originally contacted us on March 30, 2006, for information on marine listed species. On April 12, 2006, we provided a complete list of all marine protected species under NMFS's jurisdiction that may occur in waters or shorelines around the project area. Due to the amount of elapsed time since that initial coordination, you have requested an updated list of marine protected species and their designated critical habitat that may occur within/near to the proposed action area.

Based on the maps that you provided, the proposed transit route currently being analyzed in a draft environmental impact statement is entirely land-based. Portions of the proposed route and stations pass over numerous freshwater streams and occur near marine ecosystems, such as the Honolulu Harbor and the lochs of Pearl Harbor. However, it does not appear that any portions of the route will specifically transit over marine water. Therefore, no marine ESA-listed species under our jurisdiction occur in the project area. ESA-listed marine species do, however, occur in the waters surrounding the Island of Oahu. A complete list of Hawaii's marine protected species under NMFS's jurisdiction is enclosed for your review.

No additional marine species are proposed or are candidates for listing under the ESA at this time, and no critical habitat has been designated or proposed for any marine protected species around Oahu, Hawaii.

Thank you for working with NMFS to protect our nation's living marine resources. Should you have any other questions regarding this project or the consultation process, please contact Krista Graham on my staff at (808) 944-2238, or at the e-mail address Krista.Graham@noaa.gov. Please refer to consultation #: I-PI-08-671-CY.

Sincerely,

Chris E. Yates
Assistant Regional Administrator
For Protected Resources

Enclosure

HAWAII MARINE PROTECTED SPECIES
National Marine Fisheries Service, Pacific Islands Regional Office

MARINE MAMMALS:

HAWAIIAN MONK SEAL	*Monachus schauinslandi*
HUMPBACK WHALE	*Megaptera novaeangliae*
SPERM WHALE	*Physeter macrocephalus*
BLUE WHALE	*Balaenoptera musculus*
FIN WHALE	*Balaenoptera physalus*
SEI WHALE	*Balaenoptera borealis*
NORTH PACIFIC RIGHT WHALE	*Eubalaena japonica*
COMMON DOLPHIN	*Delphinus delphis*
NORTHERN ELEPHANT SEAL	*Mirounga Angustirostris*
ROUGH-TOOTHED DOLPHIN	*Steno bredanensis*
RISSO'S DOLPHIN	*Grampus griseus*
BOTTLENOSE DOLPHIN	*Tursiops truncatus*
PANTROPICAL SPOTTED DOLPHIN	*Stenella attenuata*
SPINNER DOLPHIN	*Stenella longirostris*
STRIPED DOLPHIN	*Stenella coeruleoalba*
MELON-HEADED WHALE	*Peponocephala electra*
PYGMY KILLER WHALE	*Feresa attenuata*
FALSE KILLER WHALE	*Pseudorca crassidens*
KILLER WHALE	*Orcinus orca*
SHORT-FINNED PILOT WHALE	*Globicephala macrorhynchus*
BLAINVILLE'S BEAKED WHALE	*Mesoplodon densirostris*
CUVIER'S BEAKED WHALE	*Ziphius cavirostris*
PYGMY SPERM WHALE	*Kogia breviceps*
DWARF SPERM WHALE	*Kogia sima*
MINKE WHALE	*Balaenoptera acutorostrata*
BRYDE'S WHALE	*Balaenoptera edeni*
FRASER'S DOLPHIN	*Lagenodelphis hosei*

SEA TURTLES:

LEATHERBACK TURTLE	*Dermochelys coriacea*
HAWKSBILL TURTLE	*Eretmochelys imbricata*
GREEN TURTLE	*Chelonia mydas*
OLIVE RIDLEY TURTLE	*Lepidochelys olivacea*
LOGGERHEAD TURTLE	*Caretta caretta*

THREATENED
ENDANGERED

Last updated April 2008

LINDA LINGLE
GOVERNOR OF HAWAII

Laura H. Thielen
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

Russell Y. Tsuji
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR FOR
THE COMMISSION ON
WATER RESOURCE MANAGEMENT

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND MANAGEMENT
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

April 2, 2008

RECEIVED
APR - 7 2008

Mr. Darrell Sommerlatt
Environmental Scientist
Parsons Brinckerhoff, Inc
American Saving Bank Tower
1001 Bishop Street, Suite 2400
Honolulu, Hawaii 96813

Dear Mr. Sommerlatt:

Subject: Request for Species List, Endangered Species Act, Honolulu High-Capacity Transit Corridor Project, Island of Oahu.

We appreciate the opportunity to comment on your subject request. DLNR, Division of Forestry and Wildlife know of three endangered plants that have historical significance in the Kapolei-Ewa plains area. Federal and state laws protect these plants and the identified genus-species are 1) *Chamaesyce skottsbergii* var. *skottsbergii* common name akoko, 2) *Achyranthes splendens* var. *rotundata* and 3) *Abutilon menziesii.* Please have a trained Botanist who is familiar with identifying these plants, survey your proposed transit corridor route to mitigate the potential impacts that this project may have on the endangered plants. This information should be contained in your draft EIS under flora and fauna survey. Thank you for the opportunity to comment your project.

Sincerely yours,

Paul J. Conry

Paul J. Conry
Administrator

TP 203767

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF
Office of the Chief
Regulatory Branch

April 10, 2007

APR 12 3 31 PM '07
TRANS PLANNING

Mr. Kenneth Hamayasu
Chief, Transportation Planning Division
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Mr. Hamayasu:

This letter is in response to your March 16, 2007 written invitation requesting our participation in the National Environmental Policy Act (NEPA) public scoping process for the preparation of an Environmental Impact Statement (EIS) for the ***Honolulu High-Capacity Transit Corridor Project*** ("Project") located on the Island of O'ahu, Hawaii. Based on your correspondence, I understand the Federal Transit Administration (FTA) and the City and County of Honolulu, Department of Transportation Services (DTS) will jointly prepare an EIS for this proposal in accordance with NEPA implementing regulations (40 CFR §1500-1508) and pursuant to the State EIS Law (Chapter 343, Hawaii Revised Statutes). The proposed project would implement a fixed guideway transit system in the east-west transportation corridor between Kapolei and the University of Hawai'i at Mānoa with a branch to Waikiki. Alternatives to be considered in the draft EIS include the No Action/No Build and two fixed guideway transit alternatives: one via Salt Lake Boulevard and another serving the Honolulu International Airport plus Salt Lake.

As a Federal agency with jurisdiction by law, the U.S. Army Corps of Engineers (Corps) appreciates your efforts to seek our early involvement and obtain our technical input regarding aquatic resources. I want to take this opportunity to advise the FTA and DTS the proposed Project may require a Corps permit. Enclosed you will find a permit application form and a pamphlet that describes our regulatory program (Enclosure 1). In general, a Corps permit is required for:

a) Structures or work in or affecting "navigable waters of the United States" pursuant to Section 10 of the Rivers and Harbors Act (RHA) of 1899. Examples include, but are not limited to: 1) constructing a pier, revetment, bulkhead, jetty, aid to navigation, artificial reef or island, and any structures to be placed under or over a navigable water; 2) dredging, dredge disposal, filling and excavation;

b) The discharge of dredged or fill material into, including any redeposit of dredged material within, "waters of the United States" and adjacent wetlands pursuant to Section 404 of the Clean Water Act (CWA) of 1972. Examples

include, but are not limited to: 1) creating fills for residential or commercial development, placing bank protection, temporary or permanent stockpiling of excavated material, building road crossings, backfilling for utility line crossings and constructing outfall structures, dams, levees, groins, weirs, or other structures; 2) mechanized land clearing, grading which involves filling low areas or land leveling, ditching, channelizing and other excavation activities that would have the effect of destroying or degrading waters of the United States; 3) allowing runoff or overflow from a contained land or water disposal area to re-enter a water of the United States; 4) placing pilings when such placement has or would have the effect of a discharge of fill material; and

c) Any combination of the above.

In addition, my staff offers the following comments for your consideration as part of the Project's public scoping process. Our comments are provided pursuant to our regulatory authorities promulgated under Section 404 of the CWA and Section 10 of the RHA, and are based on information presented in the *EIS Scoping Information Package for the Honolulu High-Capacity Transit Corridor Project* (dated March 15, 2007), the *Alternatives Analysis Report* (dated November 1, 2006), and the *Notice of Intent to Prepare an EIS for High-Capacity Transit Improvements in the Leeward Corridor of Honolulu* (Federal Register, 72 FR 12254, dated March 2007).

Regulatory Scope

Based on Project maps/figures and our knowledge of existing aquatic resources within the transportation corridor study area, it appears the proposed Project could potentially affect jurisdictional waters of the U.S. As your EIS technical studies and fieldwork progress, we expect that site-specific information regarding the delineation of waters of the U.S. and the characterization of the extent/intensity of potential aquatic resource impacts will assist in defining the scope of the Corps' involvement. Moreover, an estimate of the impacts to waters of the U.S. will help establish the appropriate Department of Army (DA) authorization should the proposed Project, or any of its parts, be regulated under Section 10 of the RHA and/or Section 404 of the CWA. Generally speaking, a discharge of dredged or fill material into waters of the U.S. and/or work in Section 10 navigable waters of the U.S. that complies with the terms and conditions of our nationwide permits, may be authorized in a relatively streamlined timeframe. However, for an activity that does not meet the terms and conditions of our nationwide permits and/or results in more than minimal impacts to the aquatic environment, individually or cumulatively, may instead require review under a more rigorous permitting process (e.g., standard individual permit).

We strongly encourage FTA and DTS integrate all reasonable and practicable measures during the early development of alternatives to avoid and minimize adverse impacts on the aquatic environment to the maximum extent practicable. Ensuring the proposed Project avoids and minimizes impacts to waters of the U.S. will also facilitate future Corps regulatory compliance requirements.

Purpose and Need

Foremost, the transit service should be responsive to the needs of the population it serves. As Federal and State entities charged with transportation planning, funding and implementation, we give substantial deference to the expertise of FTA and DTS in determining the project needs and purpose(s) for this public transit project. We understand the planning level alternative analysis performed in accordance with SAFETEA-LU led to the identification of a Locally Preferred Alternative (LPA), namely a fixed guideway transit. In the *Alternatives Analysis Report*, the fixed guideway transit alternative considered five transit technologies and four different alignments with varying station locations and numbers, as well as distinct characteristics and environmental impacts. In this regard, the purpose and need statement should clearly describe the relevant factors considered in defining the need and what selection criteria were applied to eliminate certain alignments and other modal alternatives from further consideration. These factors and criteria should be substantiated with existing and future traffic/transit data, including but not limited to: ridership projections, including assumptions related to the projections; savings or reduction in vehicle miles traveled (VMT); savings or reduction in vehicle hours traveled (VHT) for a.m. and p.m. peak periods; and improvements to the volume to capacity (VC) ratio and level of service (LOS). In turn, the Project purpose statement must be articulated in such a manner as to ensure a reasonable range of alternatives can be formulated to address the identified transportation problems (needs).

Page 2-1 of the Project Scoping Information Package indicates the purpose of the project is "...<u>to provide high-capacity, high-speed transit in the highly congested east-west transportation corridor between Kapolei and the University of Hawaii at Mānoa, as specified in the 2030 O'ahu Regional Transportation Plan (ORTP)</u>". Since the goal is to provide efficient, reliable and effective movement of people between Kapolei and downtown Honolulu/University of Hawaii at Mānoa the inclusion of "high-speed" may arbitrarily or inappropriately narrow the range of practicable alternatives. We recommend you consider some minor modifications to the purpose statement to ensure the Federal NEPA and CWA processes are structured to evaluate a reasonable range of alternatives, which may include multi-modal solutions. By doing so would not preclude or otherwise affect the 2006 selection of your LPA or the City and County Council's adopted "Minimum Operable Segment" identified in Resolution 07-039 FD1(C). Rather, inclusion of other non-high-speed transit and modal alternatives may provide a clearer and sharper comparison between alternatives for NEPA purposes.

Existing and modeled traffic data from the 2006 Alternatives Analysis Report suggest the implementation of the LPA will not necessarily improve the LOS on most segments of the Interstate H-1 Freeway, including the high-occupancy vehicle and Zipper lanes, within the corridor study area (Tables 3-12 and 3-13, *Alternatives Analysis Report*). For instance, at screenline locations Kalauao Stream and Kapālama Canal the LOS will remain "F" under both the Future No Action Alternative and the 2030 Fixed Guideway Alternative. That being the case, the stated goal to "improve" existing conditions, or LOS, is somewhat misleading; rather, the peak-hour volumes and LOS for

future with- and without project conditions suggest there is a need to "provide an alternate means of movement" from Kapolei to Downtown Honolulu/UH at Mānoa. To this end, we agree the inclusion of the verbiage "...to provide high-capacity transit..." is appropriate, but again, caution the use of language that is unduly restrictive.

Similar to NEPA, the CWA Section 404 (b)(1) Guidelines (Guidelines) state that a project's purpose and need is a prerequisite to establishing the reasonable range of alternatives to be evaluated. For activities or projects that are subject to a standard individual permit review process, the statement of purpose for compliance with the Guidelines has two elements: the basic and the overall project purpose. The basic project purpose defines the project purpose in its most simplistic terms and is determined to establish whether a proposed action is water dependent. The overall project purpose is the basic project purpose in consideration of the general objectives of the applicant, cost, logistics, and existing technology. It provides for a more specific definition of the purpose and need of an applicant's project. The overall project purpose should be specific enough to define the FTA's and DTS's needs, but not so restrictive as to preclude all discussion of alternatives. As you may know, the overall project purpose is used for evaluating practicable alternatives under the Guidelines, which require that if the overall purpose of a project is practicably met through several alternatives, the Corps can only authorize the least environmentally damaging practicable alternative (LEDPA).

In light of the aforementioned, we strongly encourage adherence to the general principles and guidelines regarding the development of the Project's overall purpose within the regulatory context of Section 404 of the CWA.

Alternatives and NEPA Scope of Analysis

The Council on Environmental Quality (CEQ) regulations requires an EIS objectively and rigorously examine all reasonable alternatives to the proposal. Towards this end, the range of alternatives should include reasonable alternatives that are not within the jurisdiction of FTA and/or DTS, if they exist (40 CFR 1502.14). As a matter of policy, the range of alternatives and rigor of analysis should be proportional to the level of impacts. The NEPA analysis must pursue and disclose feasible and practicable opportunities for the avoidance and minimization of impacts on the aquatic environment. For projects that are individually reviewed by the Corps, this is important in demonstrating compliance with the substantive requirements of the Guidelines, as well as consistency with our public interest review process.

Paramount to our Section 404 permit decision-making process is that proposed transit technologies and alignments which exhibit the least overall adverse environmental harm are appropriately examined in the context of "practicability" [1], especially prior to being eliminated from further consideration. In other words, as alternatives are evaluated for their effectiveness in achieving the project purpose FTA and DTS should give equal consideration to the impacts on the aquatic ecosystem and other environmental concerns, such as Department of Transportation Act Section 4(f) concerns (e.g., public parks,

[1] "Practicability" as defined by 40 C.F.R. § 230.3(q)

recreational sites, wildlife refuges and historic sites), and select the alternative that would result in the least overall environmental harm. An alternative with fewer impacts to aquatic resources than the preferred alternative may only be eliminated by demonstrating it has other overriding significant environmental impacts (40 CFR 230.10(a)).

The nature of funding for this Project and its phased implementation over the planning horizon (i.e., future extensions and station locations), requires the Project alternatives be examined in the context of independent utility and the proper NEPA scope of analysis to avoid "piecemealing" the environmental analysis. Technical data regarding independent utility and the NEPA scope of analysis should be succinctly presented in the early stages of the EIS development. The Corps believes the environmental consequences resulting from construction of the "Minimal Operable Segment" and all planned extensions must be considered in the project-level EIS, particularly if the Project benefits, wholly or partially, are derived from one or more of these future extensions and station locations. More specifically, NEPA requires the Federal lead agency define the scope of analysis for an individual EIS based on consideration of three factors: 1) the *types of actions*, 2) the *types of alternatives*, and 3) the *types of impacts*. The three types of actions include:

a. *Connected actions*, which means closely related and are connected if they:
   i. Trigger other actions,
   ii. Cannot or will not proceed unless other actions are taken previously or simultaneously, or
   iii. Are interdependent parts of a larger action and depend on the larger action for their justification.
b. *Cumulative actions*, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.
c. *Similar actions*, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography.

My staff therefore recommends the environmental review process adequately documents how the NEPA scope of analysis is defined and the range of alternatives is formulated.

Identification of Resources & Evaluation of Impacts to the Aquatic Environment

The Council on Environmental Quality (CEQ) requires the data and analyses in an EIS are commensurate with the importance of the impact (40 C.F.R. § 1502.15). Similarly, the Guidelines emphasize the level of documentation should reflect the significance and complexity of the discharge activity (40 C.F.R. § 230.6). In the context of the *Honolulu High-Capacity Transit Corridor Project*, the evaluation of project impacts should include relevant quantitative information pertaining to water resources that is coalesced in the main text of the draft EIS. These data must disclose the projected

direct, indirect and cumulative impacts (beneficial and detrimental) to the aquatic environment associated with each of the proposed alternatives in a comparative format.

An important distinction to keep in mind when evaluating the impacts, or "harm", to non-aquatic resources versus impacts to waters of the U.S., is that, for the former, the alternatives selection process evaluates reasonable and prudent alternatives based on the "net harm" after mitigation of the alternative. Conversely, Section 404 alternatives analyses, the evaluation of practicable alternatives must consider the impacts to waters of the U.S. that would result from the alternative before compensatory mitigation. That is, compensatory mitigation may not be used as a method to reduce environmental impacts in the evaluation of the LEDPA (Corps and U.S. EPA Memorandum of Agreement, 1990). These are important aspects of the environmental process to be cognizant of; specifically should the Project necessitate an individual Section 404 permit.

Direct Effects

The corridor study area is relatively large and encompasses some of the most densely populated areas on the Island of O'ahu. Consequently, many of the streams, wetlands and other aquatic resources occurring within the Project study area have been altered or disturbed by past and on-going urban development. As a consequence, these anthropogenic disturbances have, in many cases, diminished the functions and values of the aquatic resources. However, the study area does support streams and wetlands that remain relatively intact or ecologically sensitive and impacts to these areas could be deleterious.

We request the draft EIS, including any appropriate technical studies, identify the temporary and permanent impacts to waters of the U.S. In determining impacts, consideration should be given to the alignment right-of-way and transit structure, including piers and bridge structures; the location, design and overall footprint of disturbance for each transit station location, including associated parking structures; maintenance or emergency access points; and any other ancillary features that may result in the permanent or temporary loss of waters of the U.S. Temporary stream diversions and cofferdams used or employed during construction are also important to identify and include in the analysis of effects. Streambank protection or bank stabilization that may be necessitated by one or more of the transit alignments at water crossings should be similarly identified in the draft EIS.

Indirect Effects

Indirect impacts, including growth-inducing effects, must also be identified and evaluated in the draft EIS. The acknowledgment in the NOI and Scoping Information Package that Kapolei is fast becoming a "second city" and the that the Ewa Development Plan area is [unlikely] to "...develop as planned unless it is accessible to Downtown and other parts of O'ahu...to support its future growth..." reveals the importance for the EIS to evaluate the potential indirect and growth-inducing impacts on the natural environment as a result of the proposed Project. While it is likely that development in this area will

occur with or without the proposed Project, land use patterns, scheduling or timing of future development, and the nature and juxtaposition of such development may be influenced or caused by the proposed Project. In fact, national data and studies suggest VMT growth is often substantially affected by development patterns. As jobs and housing become increasingly segregated, there tends to be a corresponding increase in driving time and hence VMT. For this reason, it seems prudent to disclose how the *Honolulu High-Capacity Transit Corridor Project* may help to ameliorate this "urban sprawl" effect vis-à-vis its support of high density development. In the end, all reasonably identifiable indirect impacts, detrimental or beneficial, on the biological and physical environments should be disclosed in the EIS.

In some cases, permanent structures, such as bridges, over surface water resources have been found to negatively impact water quality and aquatic species by altering water temperatures and the type or presence of in-stream and streambank vegetation. Therefore, we recommend FTA and DTS identify any indirect and incremental shading effects that could be expected from new or expanded bridge structures associated with the proposed alternatives.

The overall health and integrity of the aquatic ecosystem depends largely on water quality, habitat vitality and diversity, and hydrologic processes. Therefore, the loss or degradation of waters of the U.S. must meaningfully consider these factors. Based on our regulations and policies, we place a high degree of importance on quantifying and characterizing the functional losses resulting from the discharge of dredged or fill material into waters of the U.S. Functions are the physical, chemical and biological attributes of a wetland/waters without regard to its importance to society. Examples of functions include flood storage, wildlife habitat, and grounder water recharge. Values are those wetlands/waters functions that generally are regarded as beneficial to society, such as recreation, aesthetics, and wildlife viewing. A functional assessment (FA) should determine which functions are performed by the wetlands/waters, the value of those functions, and how the Project will affect the continued performance of the identified functions. If a FA is deemed appropriate, the precise assessment methodology and rigor for characterizing the functions and values of aquatic resources should be determined in close consultation with the Corps. We suggest the EIS quantitatively and/or qualitatively address the anticipated functional losses to aquatic ecosystems to the extent appropriate and practicable. Factors to consider include changes to sedimentation (e.g., sediment transport, in-stream aggradation and degradation), erosion, turbidity, hydrologic regime, water quality, floodplain encroachment, invasive species, and other native habitat perturbations.

Cumulative Effects

The Council on Environmental Quality (CEQ) regulations define cumulative effect as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). A critical principle is the consideration of past and present

projects as they relate to establishing the environmental baseline and disturbance thresholds for each relevant resource. That is, the cumulative effects analysis should be conducted within the context of resource, ecosystem, and human community thresholds—levels of stress beyond which the desired condition degrades. The magnitude and extent of the effect on a resource depends on whether the cumulative effects exceed the capacity of the resource to sustain itself and remain productive. Similarly, the natural aquatic ecosystem and the human community have maximum levels of cumulative effects that they can withstand before the desired conditions of ecological functioning and human quality of life deteriorate (CEQ, 1997).

To facilitate future decision-making, all reasonably foreseeable projects, private or public that are identified, programmed, funded or approved in regional planning documents should be carefully and fully considered as part of the cumulative impact analysis. Aside from the proposed Project, all connected and similar actions that could contribute to cumulative effects (beneficial or detrimental) must be appropriately considered in the draft EIS. The cumulative impacts analysis should evaluate both the temporal (time) and spatial (geographic) effects associated with each significant environmental resource category.

Mitigation and Sequencing

The NEPA requires a discussion of mitigation for adverse environmental impacts of alternatives, where mitigation is defined to include avoidance, minimization, restoration and creation of habitats. Section 404 of the CWA also requires consideration of practicable alternatives to avoid and minimize adverse environmental impacts, and further requires that these measures be exhausted before turning to restoration and creation of habitats. Since the proposed Project alternatives are likely to cross a number of streams, channels, and other aquatic resources, we advocate design features that would likely avoid or reduce the direct impacts to surface water resources. Both on-site (e.g., design features) and off-site (e.g., different alignments) options to avoid and minimize impacts to waters of the U.S. is important in terms of demonstrating that the Project has taken appropriate and practicable steps to minimize potential adverse impacts of the discharge on the aquatic ecosystem (40 C.F.R. 230.10(d)).

Mitigation is an important aspect of the review and balancing process on many DA permit applications. Consideration of mitigation should occur throughout the permit application review process. Mitigation generally falls into three categories:

1) Project modifications to minimize adverse impacts;
2) Further mitigation measures to satisfy legal requirements; and
3) Mitigation measures that result from the public interest review process.

For unavoidable adverse impacts, compensatory mitigation must be for significant resource losses that are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment. Further, all mitigation must be directly related to the impacts of the proposed Project, appropriate to the scope and degree of

those impacts, and reasonably enforceable. The Corps recommends FTA and DTS incorporate the general tenets of our Honolulu District Mitigation Guidelines (dated February 14, 2005), Regulatory Guidance Letter (RGL) 02-02, *Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899*, and RGL 03-06 *Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Aquatic Resources* in your conceptual mitigation planning. These RGLs can be found at www.usace.army.mil/cw/cecwo/reg/rglsindx.htm. We also strongly encourage FTA and DTS give appropriate credence to the Corps and U.S. Environmental Protection Agency's joint proposed rule for "Compensatory Mitigation for Losses of Aquatic Resources" (March 28, 2006, Federal Register 15520), which we anticipate could be finalized prior to completion of the *Honolulu High-Capacity Transit Corridor Project* EIS.

The Corps also encourages the FTA and DTS to pursue any and all mitigation planning opportunities afforded at this early stage of the environmental process by leveraging the resources of Federal, State, local and non-profit entities to help with watershed-wide identification of areas suitable for wetlands enhancement, restoration and/or in-perpetuity preservation, as deemed appropriate by the Project's preliminary impact analyses. The draft EIS should propose a meaningful suite of conceptual mitigation strategies that would avoid and minimize impacts and compensate for any unavoidable adverse impacts to aquatic resources. Possible compensatory mitigation strategies could include establishment of a mitigation bank or an in lieu fee agreement; on- and/or off-site land acquisition and restoration; and control or eradication of invasive species that would enable native species to re-colonize.

Data Needs

Disclosure of the degree and magnitude of impacts is necessary for soliciting meaningful public input as well as for making informed decisions. As a matter of efficacy, the *Honolulu High-Capacity Transit Corridor Project* draft EIS should include a summary of the major impacts to water resources with accompanying aerial or topographic maps of sufficient scale that geo-spatially illustrate the potential direct and indirect effects associated with the discharge of dredged or fill material into waters of the U.S.

Although not all-inclusive, the following list comprises a general overview of the potential data needs and analyses for identifying and assessing waters of the U.S. during the Project's environmental evaluation and EIS review process.

- A delineation of all wetlands, which could be affected by the proposed Project. The delineation must follow the procedures set forth in the 1987 Wetlands Delineation Manual and include the data support forms.
- A delineation of other waters of the U.S. as follows:
  - For tidal waters, the high tide line shall be determined as described at 33 C.F.R. § 328.3(d);

- For non-tidal waters, the ordinary high water mark shall be determined as described at 33 C.F.R § 328.3(e).

- All plant and animal taxa encountered during site visits;
- A detailed assessment of the functions and values of wetlands and other waters of the U.S.
- A detailed assessment of project impacts on special aquatic sites and other waters as follows:
  - A detailed description of the project impacts, including the type of impact (e.g., habitat removal, fragmentation, introduction of exotic species) and its magnitude. These effects must be evaluated in the appropriate local or regional context.
- A detailed purpose and need statement, coordinated with the appropriate agencies. It is noteworthy to mention the Corps is solely responsible for the final approval of the overall project purpose used to conduct the 404(b)(1) alternatives analysis.
- A feasibility study of candidate mitigation sites
- Maps showing the occurrences of all associated sensitive species that have been identified within the survey area in relation to project features, including federally listed endangered and threatened species and designated critical habitat.
  - The size of the population(s) in terms of numbers of individuals and habitat occupied
  - The portion of the population(s) to be directly affected by each project alternative
  - The portion of the population to be indirectly affected by each alternative
  - The amount of suitable habitat to be directly or indirectly affected under each alternative

Inter-agency Coordination

I commend your efforts to engage our agency early in your environmental process. At this stage, our primary regulatory responsibilities associated with the *Honolulu High-Capacity Transit Corridor Project* NEPA document are to provide guidance on CWA and RHA procedures, disclose substantive issues relating to the direct, indirect and/or cumulative effects on the aquatic environment, and identify data gaps or other informational needs for our regulatory process requirements. Depending on our scope of analysis, we would also expect to provide feedback at key milestones to ensure the decisions made around Section 404 of the CWA are adequately substantiated and documented.

The 1995 *NEPA/404 Integration Process Memorandum of Understanding* (MOU) for *Surface Transportation Projects in the State of Hawaii* may have utility with this proposed FTA/DTS transit project. The MOU establishes formal procedures for Federal regulatory and resource agencies to work collaboratively with the transportation lead agencies to streamline the environmental review process. Implementation of the MOU merger procedures have been found particularly helpful for large-scale surface transportation projects that are expected to adversely affect waters of the U.S. and other environmentally sensitive resources.

I recognize the importance this transit project has to the City and County of Honolulu and in particular, to the quality of life for the commuting public. Conceptually, the implementation of a fixed guideway transit system could result in substantial transportation benefits to the leeward communities and a net overall environmental benefit in terms of air quality, noise and socioeconomics when compared to other transportation improvement or modal options. For these reasons, I look forward to my staff working collaboratively with FTA, DTS, and other Federal, State and local agencies to ensure the purpose and needs of this project are met while avoiding and minimizing the adverse impacts to the aquatic environment to the maximum extent practicable. If you have any questions or need clarification on our comments, please feel free to contact Ms. Susan A. Meyer of my staff at (808) 438-2137 or susan.a.meyer@usace.army.mil.

Sincerely,

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

Enclosure

Copies Furnished (w/o encl):
Ms. Connell Dunning and Dr. Wendy Wiltse, U.S. Environmental Protection Agency
Mr. Michael Molina, U.S. Fish and Wildlife Service
Mr. John Naughton, NOAA, Fisheries
CEPOH-PP-C (Mr. Paul Mizue)

ENCLOSURE 1

Permit Application (ENG FORM 4345)
and
Regulatory Permit Program pamphlet

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT *(33 CFR 325)*	OMB APPROVAL NO. 0710-0003 Expires December 31, 2004

The public reporting burden for this collection of information is estimated to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies. Submission of requested information is voluntary, however, if information is not provided, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE *(an agent is not required)*
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NUMBERS WITH AREA CODE a. Residence b. Business	10. AGENT'S PHONE NUMBERS WITH AREA CODE a. Residence b. Business

11. **STATEMENT OF AUTHORIZATION**

I hereby authorize _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE DATE

NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE *(see instructions)*

13. NAME OF WATERBODY, IF KNOWN *(if applicable)*	14. PROJECT STREET ADDRESS *(if applicable)*
15. LOCATION OF PROJECT COUNTY STATE	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

17. DIRECTIONS TO THE SITE

18. Nature of Activity *(Description of project, include all features)*

19. Project Purpose *(Describe the reason or purpose of the project, see instructions)*

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled *(see instructions)*

23. Is Any Portion of the Work Already Complete? Yes _____ No _____ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

*Would include but is not restricted to zoning, building and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT _____ DATE _____ SIGNATURE OF AGENT _____ DATE _____

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States, knowingly and willfully falsifies, conceals, or covers up any trick scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Instructions for Preparing a
Department of the Army Permit Application

Blocks 1 through 4. To be completed by Corps of Engineers.

Block 5. Applicant's Name. Enter the name of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. Note: An agent is <u>not</u> required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by applicant, if an agent is to be employed.

Block 12. Proposed Project Name or Title. Please provide name identifying the proposed project, *e.g.*, Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center.

Block 13. Name of Waterbody. Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Project Street Address. If the proposed project is located at a site having a street address (not a box number), please enter it here.

Block 15. Location of Proposed Project. Enter the county and state where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

Block 16. Other Location Descriptions. If available, provide the Section, Township, and Range of the site and / or the latitude and longitude. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known.

Block 17, Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site.

Block 18. Nature of Activity. Describe the overall activity or project. Give appropriate dimensions of structures such as wingwalls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.

Block 19. Proposed Project Purpose. Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

Block 20. Reasons for Discharge. If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

Block 21. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards. Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

Block 22. Surface Areas of Wetlands or Other Waters Filled. Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked Block 22.

Block 23. Is Any Portion of the Work Already Complete? Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identity the authorization, if possible.

Block 24. Names and Addresses of Adjoining Property Owners, Lessees, etc.,Whose Property Adjoins the Project Site. List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24.

Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.

Block 25. Information about Approvals or Denials by Other Agencies. You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

Block 26. Signature of Applicant or Agent. The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View <u>or</u> a Typical Cross-Section Map. Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8½ x11 inch plain white paper (tracing paper or film may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section). **While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.**

PENALTIES

Violation of pertinent laws may result in the following penalties:

* Removal of material and restoration

* Fines from $500 to $50,000 a day

* Imprisonment up to one year

PERMIT FEES

Fees shall be assessed as follows:

* Commercial or industrial use - $100.00

* Non-commercial use - $10.00

Fees should not be submitted with permit application, but will be collected prior to issuance of the permit.

MAJOR COORDINATING AGENCIES

FEDERAL

US Environmental Protection Agency

U.S. Fish and Wildlife Service

National Marine Fisheries Service

Fourteenth Coast Guard District

STATE & LOCAL

State of Hawaii & various counties

Territories of Guam & American Samoa

~~Trust Territory of the Pacific Islands~~

Commonwealth of the Northern Mariana Islands

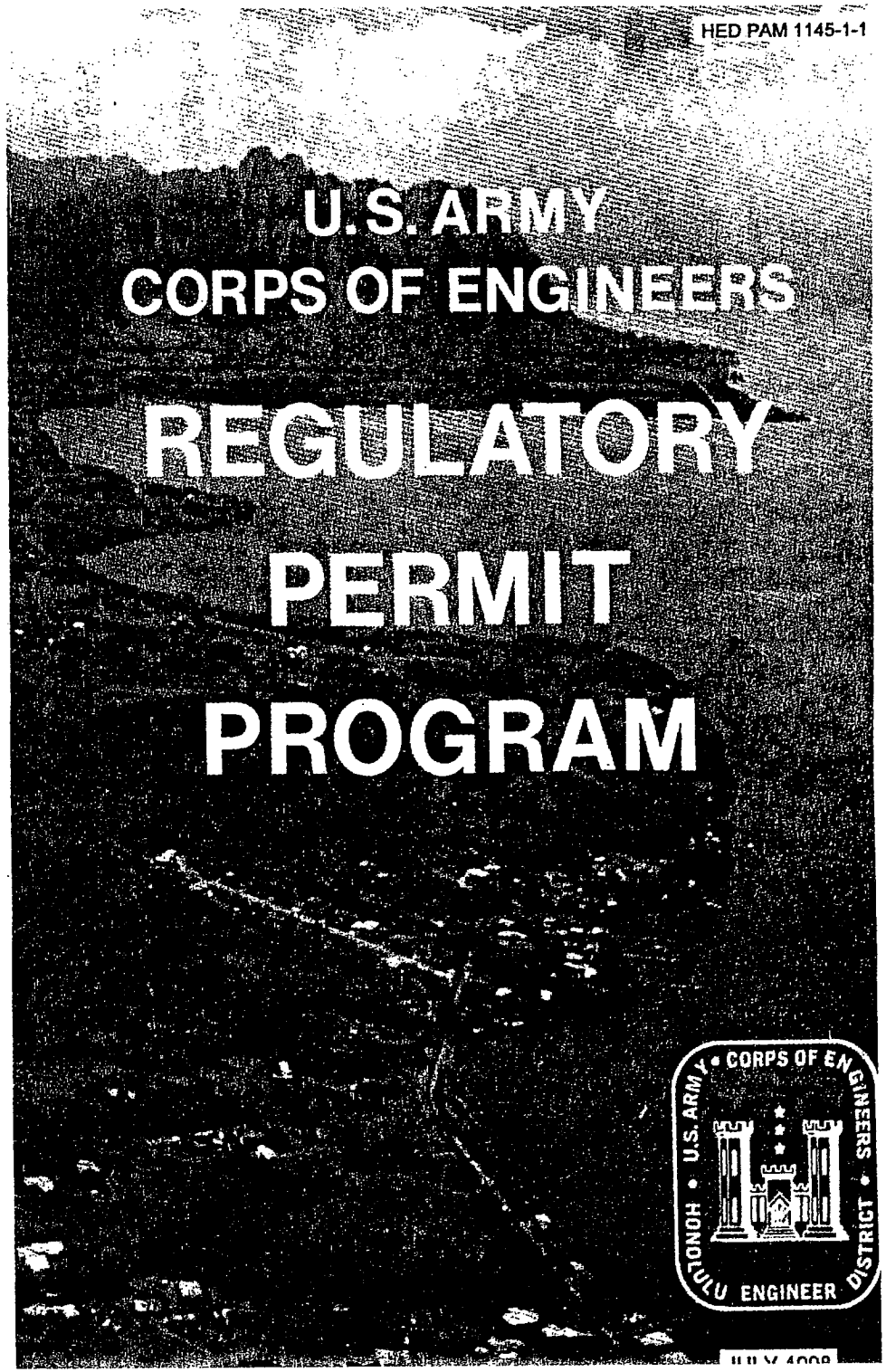
For Additonal information, contact:

U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter Hawaii 96858-5440
Phone: (808)438-9258

HED PAM 1145-1-1

U.S. ARMY CORPS OF ENGINEERS

REGULATORY PERMIT PROGRAM



JULY 1988

INTRODUCTION

Under the laws of the United States, Congress has assigned to the U.S. Army Corps of Engineers certain non-military roles and functions. These include the better known traditional missions in navigation, flood control, hydropower production, water supply storage, and recreation. Congress has also given the Corps of Engineers certain regulatory responsibilities for work in the waters of the United States. The reasons for this are to (1) protect our nation's navigation channels and harbors against destruction and encroachments, and (2) restore and maintain environmental quality by regulating the discharge of dredged or fill material in coastal and inland waters and wetlands, construction and dredging in waters of the United States, and transportation of dredged material for dumping into ocean waters.

WHO IS REQUIRED TO OBTAIN A PERMIT?

Any individual, firm or agency (including Federal, State and local governmental agencies) who plans to do work in the waters of the United States must obtain a permit from the U.S. Army Corps of Engineers. In addition, permits, licenses, variances or other authorizations required by Federal, State or local laws and regulations must be obtained. Private ownership of the land beside or under the water has no effect on the requirement to obtain a permit.

PURPOSE

The permit program is designed to:

- Insure that our nation's water resources are safeguarded.
- Insure that our nation's water resources are used in the best interest of the people.
- Insure that environmental — social — economic concerns of the public are considered.

LAWS

The U.S. Army Corps of Engineers permit program is based primarily on the following Acts of Congress:

THE RIVER AND HARBOR ACT of 1899. Prohibits unauthorized construction in navigable waters of the United States.

THE FEDERAL WATER POLLUTION CONTROL ACT of 1972 (Public Law 92-500.) Governs disposal of dredged or fill material in waters of the United States.

THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT of 1972. Regulates transportation of dredged material for the purpose of dumping in ocean waters.

THE NATIONAL ENVIRONMENTAL POLICY ACT of 1969. States national policy to encourage productive and enjoyable harmony between man and his environment. Started Environmental impact Statement requirement.

THE FISH AND WILDLIFE ACT of 1958. Requires the Corps to coordinate permit applications with State and Federal fish and wildlife agencies.

THE NATIONAL HISTORIC PRESERVATION ACT of 1966. Requires coordination on matters involving historic preservation.

THE COASTAL ZONE MANAGEMENT ACT of 1972. Requires compliance with State's coastal zone management program.

THE ENDANGERED SPECIES ACT of 1973. Requires coordination to insure that actions taken do not jeopardize the continued existence of endangered and threatened species.

TYPICAL ACTIVITIES REQUIRING PERMITS

The following types of activities in waters of the United States and wetlands may require a permit:

- Construction of piers, wharves, bulkheads, piling, marinas, docks, ramps, floats, mooring buoys, and like structures.
- Construction of wires and cables over the water, and pipes, cables or tunnels under the water.
- Dredging and excavation.
- Any obstruction or alteration of navigable waters.
- Depositing fill and dredged material.
- Filling of wetlands adjacent or contiguous to waters of the United States.
- Construction of riprap, revetments, groins, breakwaters, and levees.
- Transportation of dredged material for dumping into ocean waters.

WATERS OF THE UNITED STATES INCLUDE . . .

- Ocean waters.
- Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including adjacent wetlands.
- Tributaries to navigable waters of the United States, including adjacent wetlands.
- Fishponds connected to navigable waters of the United States.
- All other waters of the United States, such as lakes, rivers and streams that are not interstate waters or tributaries to navigable waters of the United States, impoundments, perched wetlands, and intermittent streams, where the District Engineer determines that regulation is required to protect interstate commerce and the aquatic environment.

WETLANDS

- Certain unique pond systems
- Inland and coastal shallows
- Marshes
- Estuaries
- Swamps
- Other areas associated with coastal and inland waters of the United States.

PROCESSING PERMIT APPLICATIONS

Processing of permit applications includes:

- Publishing public notices and news releases.
- Seeking advice and comments of private organizations and general public.
- Conducting public hearings, as required.
- Preparing Environmental Impact Statements, as required.

CONSIDERATIONS

When studying a permit application, the factors listed below are considered:

- Conservation
- Economics
- Archaeological or Historic Values
- Water Quality
- Aesthetics
- Recreation
- Navigation
- Water Supply
- General Environmental Concerns
- Land Use Classification
- Needs and Welfare of the People
- Flood Damage Prevention
- Fish and Wildlife Values
- No permit will be granted unless its issuance is found to be in the public interest.

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
DEPUTY DIRECTOR - LAND

DEAN NAKANO
ACTING 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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

May 1, 2006

RECEIVED
MAY - 3
PARSONS BRINCKERHOFF
HONOLULU, HAWAII

Nami Ohtomo, Environmental Planner
Parsons, Brinckerhoff, Quade, and Douglas, Inc.
American Savings Bank Tower
1001 Bishop Street, Suite 2400
Honolulu, HI 96813

Dear Ms. Nami,

The only species that Division of Aquatic Resources have any concerns about that are listed in Hawaii Revised Statutes Chapter 195D are whales, marine turtles and monk seals.

Although the City & County Study Area Maps describes briefly the proposed project, we suggest the forthcoming DEIS discuss in detail potential short term impacts and propose specific means for averting or minimizing adverse effects, and provide possible mitigation for unavoidable damage to natural resource values such as Best Management Practices and Water Quality Monitoring.

All proposed stream, shoreline and seaward activities in the vicinity should be adequately described in the DEIS and the Department should have the opportunity to review all project related effects to the aquatic environment. Crossings of drainageways or perennial freshwater streams necessary for the project should be adequately described in the DEIS

Specific impacts from some of the projects described cannot be identified at this time. Many previous transportation proposals have been reviewed by our Division and comments have been provided. We do not expect any significant adverse effects on the aquatic environment from the future activities anticipated. However, when additional information about the projects becomes available, we would appreciate further opportunity to address any potential aquatic resources concerns. We will review the DEIS when it is completed and comment on any significant impacts adverse to aquatic resource values at a later date.

Sincerely,

Francis Oishi

for Dan Polhemus, Administrator
Division of Aquatic Resources

Appendix B
Plant Species List

PLANTS SPECIES LIST – HHCTC, Oahu, Hawaii
Sections I & II

The following checklist is an inventory of all the plant species observed within Sections I & II of the proposed Honolulu High-Capacity Transit Corridor Alignments. The plant names are arranged alphabetically by family and then by species into two groups: Monocots and Dicots. The taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner *et al*. (1990), Wagner and Herbst (1999) and Staples and Herbst (2005). Recent name changes are those recorded in the Hawaii Biological Survey series (Evehuis and Eldredge, eds, 1999-2002).

For each species, the following name is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:

   I= indigenous= native to the Hawaiian Islands and elsewhere.

   X=introduced or alien = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, including Polynesian introductions and during and after Western contact, that is Cook's arrival in the islands in 1778

Table 4-3. Plant Species Found Within Fixed Guideway Alignment Sections I & II.

SCIENTIFIC NAME	COMMON NAME	STATUS
MONOCOTS		
AGAVACEAE		
Agave sisalana Perrine	sisal	X
Cordyline fruticosa (L.) A.Chev.	Ti, ki	X
ALOEACEAE		
Aloe vera (L.) N.L.Burm.	Aloe	X
ARACEAE		
Colocasia esculenta(L.) Schott	Kalo, taro	X
Dracaena sp. L.	dracaena	X
ARECACEAE		
Areca catechu L.	Betel nut palm	X
Cocos nucifera L.	coconut	X
Phoenix dactylifera L.	Date palm	X
CYPERACEAE		
Cyperus rotundus L.	Kili oopu	X
MUSACEAE		
Musa sp. L.	banana	X
POACEAE		
Bambusa sp. Schreber	bamboo	X
Brachiaria mutica (Forssk.) Stapf	California grass	X
Cenchrus ciliaris L.	Buffelgrass	X
Cenchrus echinatus L.	Common sandbur	X
Chloris barbata (L.) Sw.	Swollen fingergrass	X
Coix lachryma-jobi L.	Job's tears, puoheohe	X
Cymbopogon citratus (DC) Stapf	Lemon grass	X
Cynodon dactylon (L.) Pers	manienie	X
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X
Eleusine indica (L.) Gaertn.	wiregrass	X
Eragrostis tenella (L.) P.Beauv. Ex Roem.&Schult.		X
Leptochloa fusca (L.) Kunth ssp. *uninerva* (J.Presl) N.Snow	sprangletop	X
Melinus repens (Willd.) Zizka	Natal redtop	X
Panicum maximum L.	Guinea grass	X
Paspalum dilatatum Poir.	Dallis grass	X
Paspalum urvillei Steud.	Vasey grass	X
Pennisetum purpureum Schumach.	Elephant grass	X
Saccharum officinarum L.	Sugar cane, ko	X
Setaria verticillata (L.) P.Beauv.	Bristly foxtail	X
Sorghum bicolor (L.) Moench	Sorghum	X
Sorghum halapense (L.) Pers.	Johnson grass	X
Zea mays L.	corn	X

DICOTS		
ACANTHACEAE		
Asystasia gangetica (L.) T. Anderson	Chinese violet	X
AIZOACEAE		
Trianthema portulacastrum L.		X
AMARANTHACEAE		
Achyranthes aspera L.		X
Alternanthera pungens Kunth	Khaki weed	X
Amaranthus spinosus L.	Spiny amaranth	X
Amaranthus viridis L.	Slender amaranth	X
ANACARDIACEAE		
Mangifera indica L.	mango	X
Schinus terebinthifolius Raddi	Christmas berry	X
ANNONACEAE		
Annona muricata L.	soursop	X
APOCYNACEAE		
Thevetia peruviana (Pers.) K.Schum.	Be-still tree	X
ARALIACEAE		
Schefflera actinophylla (Endl.) Harms	Octopus tree	X
ASCLEPIADACEAE		
Stapelia gigantea N.E.Br.	Zulu-giant	X
ASTERACEAE		
Ageratum houstonianum Mill.	bluemink	X
Bidens alba (L.) DC. var. *radiata* (Sch. Bip.) Ballard ex Melchert	Beggar tick	X
Bidens pilosa L.	Spanish needle	X
Conyza bonariensis (L.) Cronq.	Hairy horseweed	X
Crassocephalum crepidioides (Benth.) S.Moore	crassocephalum	X
Eclipta prostrata (L.) L.	False daisy	X
Emilia fosbergii Nicolson	Red pualele	X
Lactuca serriola L.	Prickly lettuce	X
Pluchea carolinensis (Jacq.) G. Don	sourbush	X
Pluchea indica (L.) Less.	Indian fleabane	X
Pluchea x *fosbergii* Coopper. & Galang	fleabane	X
Sonchus oleraceus L.	pualele	X
Tridax procumbens (L.)	Coat buttons	X
(Cav.) Benth. & Hook	Golden crown-beard	X
Xanthium strumarium L. var. *canadense* (Miller)	kikania	X
BATACEAE		
Batis maritima L.	pickleweed	X
BIGNONIACEAE		
Spathodea campanulata P. Beauv.	African tulip	X
BORAGINACEAE		

Cordia sebestena L.	Geiger tree	X
Heliotropium curassavicum L.	kipukai	I
Heliotropium procumbens Mill. var. *depressum* (Cham.) Fosberg		X
BUDDLEIACEAE		
Buddleia asiatica Lour.	Dog tail	X
CACTACEAE		
Opuntia ficus-indica (L.) Mill.	panini	X
CAPPARACEAE		
Cleome gynandra L.	Wild spider flower	X
CARICACEAE		
Carica papaya L.	papaya	X
CASUARINACEAE		
Casuarina equisetifolia L.	ironwood	X
CHENOPODIACEAE		
Atriplex semibaccata R.Br.	Australian saltbush	X
Chenopodium murale L.	aheahea	X
CLUSIACEAE		
Clusia rosea Jacq.	Autograph tree	X
COMMELINACEAE		
Commelina diffusa Burm. f.	honohono	X
CONVOLVULACEAE		
Ipomoea cairica (L.) Sweet	Ivy leaved morning glory, koali ai	X
Ipomoea obscura (L.) Ker Gawl.		X
Ipomoea triloba L.	Little bell	X
Merremia aegyptia (L.) Urb.	Hairy merremia	X
CUCURBITACEAE		
Coccinea grandis (L.) Voigt	Ivy gourd	X
Cucumis dipsaceus ehrenb. Ex Spach	Hedgehog gourd	X
Cucumis melo L.	melon	X
Cucumis sativus L.	cucumber	X
Cucurbita sp. L.	Gourd, pumpkin	X
Momordica charantia L.	Balsam pear	X
EUPHORBIACEAE		
Aleurites moluccana (L.) Willd.	kukui	X
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X
Chamaesyce hypercifolia (L.) Millsp.	graceful spurge	X
Chamaesyce hyssopifolia (L.) Small		X
Euphorbia heterophylla L.	kaliko	X
Ricinus communis L.	Castor bean	X
FABACEAE		

Acacia farnesiana (L.) Willd.	Klu, aroma, kolu	X
Chamaecrista nictitans (L.) Moench	Partridge pea	X
Clitoria ternatea L.	Blue pea	X
Crotalaria incana L.	Fuzzy rattlepod	X
Crotalaria pallida Aiton	Smooth rattlepod	X
Desmanthus pernambucanus (L.) Thell.	Slender or virgate mimosa	X
Desmodium tortuosum (Sw.) DC	Florida beggarweed	X
Enterolobium cyclocarpum (N.Jacquin) Grisebach	Earpod	X
Erythrina variegata L.	Tropical coral tree	X
Indigofera hendecaphylla Jacq.	Creeping indigo	X
Indigofera suffritocosa Mill.	Iniko	X
Leucaena leucocephala (Lam.) de Wit	Koa haole	X
Macroptilium lathyroides (L.) Urb.	Wild bean	X
Peltophorum pterocarpum (A.P. de Candolle) K. Heyne	Yellow poinciana	X
Pithecellobium dulce (Roxb.) Benth.	opiuma	X
Prosopis pallida (Humb. & Bonpl. Ex Willd.) Kunth	Kiawe, algaroba	X
Samanea saman (Jacq.) Merr.	monkeypod	X
Senna surattensis (Burm.f.) H.S.Irwin & Barneby	kolomona	X
Tamarindus indica L.	tamarind	X
LAMIACEAE		
Hyptis pectinata (L.) Poit.	Comb hyptis	X
Leonotis nepetifolia (L.) R.Br.	Lion's ear	X
LAURACEAE		
Cassytha filiformis L.	Kauna`oa pehu	I
MALVACEAE		
Abutilon grandifolium (Willd.) Sweet	Hairy abutilon	X
Abutilon incanum (Link.) Sweet	Hoary abutilon	X
Malva parviflora L.	Cheese weed	X
Malvastrum coromandelianum (L.) Garcke	False mallow	X
Sida ciliaris L.		X
Sida fallax Walp.	`ilima	I
Sida rhombifolia L.		X
Sida spinosa L.	Prickly sida	X
MELIACEAE		
Melia azerdarach L.	Pride of India	X
MORACEAE		
Ficus microcarpa L.f.	Chinese banyan	X
Morus sp. L.	Mulberry	X
MORINGACEAE		
Moringa oleifera Lamark	Horseradish tree	X
MYRTACEAE		
Eucalyptus degulpta Blume	Painted gum	X
Psidium guajva L.	Common guava	X
Syzigium cumini (L.) Skeels	Java plum	X

NYCTAGINACEAE		
Boerhavia coccinea Mill.		X
Bougainvillea sp. A.L. Jussieu	bougainvillea	X
ONAGRACEAE		
Ludwigia octovalvis (Jacq.) Raven	Primrose willow	X
PASSIFLORACEAE		
Passiflora foetida L.	Love-in-a-mist	X
POLYGONACEAE		
Antigonon leptopus Hook&Arnott	Mexican creeper	X
PORTULACACEAE		
Portulaca oleracea L.	pigweed	X
RHIZOPHORACEAE		
Rhizophora mangle L.	Red or American mangrove	X
RUBIACEAE		
Morinda citrifolia L.	noni	X
RUTACEAE		
Citrus xparadisi MacFadyen	grapefruit	X
Citrus sp. L.	citrus	X
SOLANACEAE		
Datura stramonium L.	Jimson weed	X
Nicandra physalodes (L.) Gaertn.	Apple of Peru	X
Nicotiana glauca R.C. Graham	Tree tobacco	X
Solanum americanum Mill.	Glossy nightshade, popolo	I
Solanum lycopersicum L. var. *cerasiforme* (Dunal) Spooner, G.J. Anderson & R.K. Jansen	Cherry tomato	X
Solanum torvum Sw.		X
STERCULIACEAE		
Waltheria indica L.	`uhaloa	I
VERBENACEAE		
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	X
Vitex trifolia L.	Blue vitex	X
ZYGOPHYLLACEAE		
Tribulus terrestris L.	Puncture vine	X