3.5 LAND USE

3.5.1 Resource Definition

Land use refers to the use of land as prescribed by a governing entity. Governing entities utilize land use planning to manage development of land within their jurisdictions. Zoning is used to regulate activities that can be accommodated on a property, and is used as a tool for implementing land use plans.

Terrestrial including Shoreline

Land use on terrestrial setting refers to prescribed use on a property as defined by and administered by the applicable agency.

Marine

Land use in a marine setting—submerged land—refers to prescribed uses of land seaward of the shoreline to the extent of the nearshore waters as defined by and administered by the applicable agency.

3.5.2 Regulatory Setting

The following rules and regulations apply to land use.

- State Land Use
- County Zoning
- Coastal Zone Management Act (HRS Chapter 205A)
- Special Management Area (HRS Chapter 205)
- General Plans
- Community Plans

Refer to Appendix C – Regulatory Review, Permits, and Approvals for a list of rules, regulations, objectives, and goals pertinent to land use, as well as other applicable resources, as required pursuant to HAR Title 11 Chapter 200-17.

3.5.3 Region of Influence

The ROI is the landing site area potentially affected by implementation of the undersea power cable system.

3.5.4 <u>Affected Environment</u>

General

<u>State Land Use (HRS Chapter 205)</u>

According to HRS Chapter 205-2 (“Districting and Classification of Lands”), all lands in the state of Hawaiʻi are placed in four major land use districts: urban, rural, agricultural, and conservation. The following descriptions of the four major state land use districts are reproduced from the State of Hawaiʻi Land Use Commission page (State of Hawaiʻi Land Use Commission 2012).

Urban districts

The urban district generally includes lands characterized by “city-like” concentrations of people, structures, and services. This district also includes vacant areas for future development.

Jurisdiction of this district lies primarily with the respective counties. Generally, lot sizes and uses permitted in the district area are established by the respective county through ordinances or rules.

Rural districts

Rural districts are composed primarily of small farms intermixed with low-density residential lots with a minimum size of one-half acre.

Jurisdiction over rural districts is shared by the Commission and county governments. Permitted uses include those relating or compatible to agricultural use and low-density residential lots. Variances can be obtained through the special use permitting process.

Agricultural districts

The agricultural district includes lands for the cultivation of crops, aquaculture, raising livestock, wind energy facility, timber cultivation, agriculture-support activities (i.e., mills, employee quarters, etc.) and land with significant potential for agriculture uses. Golf courses and golf-related activities may also be included in this district, provided the land is not in the highest productivity categories (A or B) of the Land Study Bureau’s detailed classification system.

Uses permitted in the highest productivity agricultural categories are governed by statute. Uses in the lower-productivity categories—C, D, E or U—are established by the Commission and include those allowed on A or B lands as well as those stated under HRS Chapter 205-4.5.

Conservation districts

Conservation districts are composed primarily of lands in existing forest and water reserve zones and include areas necessary for protecting watersheds and water sources, scenic and historic areas, parks, wilderness, open space, recreational areas, habitats of endemic plants, fish and wildlife, and all submerged lands seaward of the shoreline. The conservation district also includes lands subject to flooding and soil erosion.

Conservation districts are administrated by the State Board of Land and Natural Resources and uses are governed by rules promulgated by the State Department of Land and Natural Resources.

<u>County Zoning</u>

Zoning is used to regulate activities that can be accommodated on a property and is used as a tool for implementing land use plans. The powers granted to counties under HRS Chapter 205-46-4 shall govern the zoning within the districts, other than conservation districts, which is governed by the Department of Land and Natural Resources (DLNR) (HRS Chapter 205-5.a-b, “Zoning”). Within agricultural districts, uses compatible to those described in the HRS HRS Chapter 205-2 (“Districting and Classification of Lands”) shall be permitted. Each county—Kauai, Honolulu, Maui, and Hawai‘i—prepares and updates its own land use plans that conform to the state land use designations and applies its own zoning codes to enforce uses to manage development of land within each jurisdiction.

<u>Coastal Zone Management Act (HRS Chapter 205A)</u>

The Coastal Zone Management Act of 1972 (CZMA) is the primary federal law enacted to preserve and protect coastal resources. The CZMA sets up a program under which coastal states are encouraged to develop coastal management programs. States with an approved coastal management plan are able to review federal permits and activities to determine if they are consistent with the state’s management plan. All parts of the Hawai‘i are located within the coastal zone and are subject to HRS Chapter 205A (State of Hawai‘i, Office of Planning 2011).

The Hawai‘i CZM law, HRS Chapter 205A, is the legal foundation of the Hawai‘i CZM Program. It is the State’s policy umbrella for designing and carrying out land and water uses and activities, recognizing the needs for economic development and resource conservation. The statute has five parts:

- Part I defines the overall CZM Program;
- Part II describes the special management area (SMA) and its permit system;
- Part III describes the shoreline setbacks;
- Part IV addresses marine and coastal affairs; and

- Part V includes other provisions, such as the prohibition of artificial lights on the shoreline and ocean (State of Hawaiʻi, Office of Planning 2011).

CZM has 10 objectives. Each of these objectives has supporting policies that guide the CZM Program. These objectives direct the management process toward consistency, predictability, and compliance with the law. The objectives are:

- recreational resources
- historic resources
- scenic and open space resources
- coastal ecosystems
- economic uses
- coastal hazards
- managing development
- public participation
- beach protection
- marine resources.

All parts of the landing site areas are located in the CZM area.

Special Management Area (HRS Chapter 205A-26)

HRS Chapter 205A also codified SMAs—predominantly shoreline areas needing particularly careful management. The land extending inland from the shoreline as delineated on the maps filed with the authority as of June 8, 1977, or as amended pursuant to HRS Chapter 205A-23, as designated SMAs. The entire coastal line in the landing site area is located in the SMA.

HRS Chapter 205A establishes minimum guidelines and a permit procedure for the counties to follow, but each county designates its own SMAs (as well as shoreline setbacks and enforcement).

Maui County-Oʻahu Routing Specific

Maui County Code permits public utility substations in areas zoned Public/Quasi-Public (“P” [Maui County Code of Ordinances Chapter 19.31.020.A.k]).

Maui

Maui-Kahului Harbor

Terrestrial

Most of the communities of Waihee-Waiehu, Wailuku, and Kahului, which compose the landing site area, are in Hawai'i urban land use district; the landing site area is the most urbanized region in the county. The landing site area contains Maui's major harbor, airport, and university campus, as well as the county seat. Additionally, the island's major commercial activities are located in the landing site area. These communities are primarily single-family residential and Wailuku contains a cluster of business/industrial uses on the landward ("mauka") side of Route 340. See Figure 3.5-1 for the land use designations in the Maui-Kahului Harbor landing site area.

The western tip of the landing site area near Waihee-Waiehu and parts of Wailuku are located in the state agricultural use district. Uses in the district include the Waiehu Golf Course and agricultural activities. The eastern portion of Kahului Harbor and an expanse of land abutting the Kahului Airport are under conservation land use and accommodate the Kanaha Pond State Wildlife Sanctuary.

The landing site area contains many parcels with a P zoning designation; many are concentrated in the Kahului area (Wailiku-Kahului Community Plans 1987). See Figure 3.5-2 for zoning designations in the Kahului landing site area.

Major landowners in the landing site area include the State of Hawai'i, State of Hawai'i Department of Hawaiian Homelands (DHHL), County of Maui, HECO, HRT, the Roman Catholic Church, Alexander & Baldwin, and Maui Land & Pine. See Figure 3.5-3 for major landowners and private parcels in the Maui-Kahului Harbor landing site area.

State Waters

All submerged lands in the state of Hawai'i are within the conservation use district, and as such are regulated by DLNR. Harbor use at the state's 10 harbors is under the administration of the State Department of Transportation, Harbor Division. The landing site area contains Kahului Deep Harbor.

State waters are in the "Resource" subzone under the state conservation use district (HRS Chapter 13-5-13). The project component is an allowed use (HRS Chapter 13-5-22. P-12).

Maui-Kapalua (West Maui)

Terrestrial

The Maui-Kapalua landing site area contains all state land use designations; much of the landing site area contains uses associated with the predominant resort facilities in Kapalua. Uses include golf courses, single-family residences, resorts, and ancillary features (neighborhood/commercial shops). There are agricultural activities interspersed with the dominant tourism activities in Kapalua. The coastal boundaries of the landing site area are under the conservation use designation. See Figure 3.5-4 for land use designations in the Maui-Kapalua landing site area.

The landing site area contains pockets of P zone properties interspersed along the coast (West Maui Land Use [Map 1 of 2] 1996). See Figure 3.5-5 for zoning designations in the Maui-Kapalua landing site area.

Maui Land & Pine is a major landowner in the landing site area. See Figure 3.5-6 for major landowners and private parcels in the Maui-Kapalua landing site area.

State Waters

All submerged lands in the state of Hawaiʻi are within the conservation use district, and as such are regulated by DLNR.

Lānaʻi

Terrestrial

All parts of the landing site area are designated for conservation. See Figures 3.5-7 and 3.5-8 for land use designations for the Lānaʻi landing site area. Currently, the area is undeveloped. Moreover, the landing site area does not contain P zones (Lānaʻi Community Plan 1998). The planning is area is under the ownership of Castle & Cooke. See Figure 3.5-9 for major landowners and private parcels in the Lānaʻi landing site area.

State Waters

All submerged lands in the state of Hawaiʻi are within the conservation use district, and as such are regulated by DLNR.

Molokaʻi

Molokaʻi-Kaluakoi (Molokaʻi-West)

Terrestrial

The landing site area along the west coast of the island is primarily under the state agricultural use district. A segment of the landing site area along the north is used to support the island’s major resort and associated functions (e.g., golf course). Currently the former Kaluakoi site supports condominium use and single-family residences are interspersed along Papohaku Beach. Agricultural use abuts the former golf course, transitioning from a passive recreational use to agricultural activity. Portions of the landing site area, including ʻIlio Point and the coastal edges, are under conservation use. See Figures 3.5-10 and 3.5-11 for land use designations for the landing site area. Major landowners include the State of Hawaiʻi, County of Maui, and Molokaʻi Ranch. See Figure 3.5-12 for major landowners and private parcels in the Molokaʻi-Kaluakoi landing site area.

State Waters

All submerged lands in the state of Hawaiʻi are within the conservation use district, and as such are regulated by DLNR.

Molokaʻi-Kaunakakai (Molokaʻi-South)

Terrestrial

The entire landing site area is located under agricultural use district. A known activity in the landing site area includes a broodstock farm; however, the area is otherwise undeveloped. See Figures 3.5-13 and 3.5-14 for land use designations in the landing site area.

Major landowners include the State of Hawaiʻi, DHHL, and Molokaʻi Ranch. See Figure 3.5-15 for major landowners and private parcels in the Molokaʻi-Kaunakakai landing site area.

State Waters

All submerged lands in the state of Hawaiʻi are within the conservation use district, and as such are regulated by DLNR.

O‘ahu

The approval of discretionary permits with conditions is required for “wind machines” in the City and County of Honolulu zoning districts: AG-1, AG-2, Country, R-20, R-10, R-3.5, R-5, R-7.5, B-1, B-2, I-1, I-2, and IMX-1 (Revised Ordinance of Honolulu 1990[4]).

O‘ahu-MCBH at Kāne‘ohe Bay

Terrestrial

STATE LAND USE

The landing site area contains two land use designations: urban and conservation. Part of the landing site area at MCBH at Kāne‘ohe Bay is developed to support its mission. The area outside of the base—the communities of Kailua and Lanikai—are fully urbanized and built out, containing residential and ancillary commercial uses (neighborhood uses). See Figure 3.5-16 for land use designations for the MCBH at Kāne‘ohe Bay landing site area.

The landing site area contains many of the City and County zoning designations that may approve the use of a converter station with a discretionary approval. See Figure 3.5-17 for information on zoning in the landing site area.

Major landowners in the landing site area include the U.S. government, State of Hawai‘i, City and County of Honolulu, Kamehameha Schools, the Roman Catholic Church, and the Bishop Museum. See Figure 3.5-18 for major landowners and private parcels in the MCBH at Kāne‘ohe Bay landing site area.

State Waters

Submerged lands off of MCBH at Kāne‘ohe Bay are under the administration of the U.S. government. Submerged lands in the state of Hawai‘i are within the State’s conservation use district, and as such are regulated by DLNR.

O‘ahu-Pearl Harbor

Terrestrial

STATE LAND USE

Nearly all of the landing site area is under the urban land use district. Uses are associated with the following: single-family residential communities (Ewa Beach), JBPHH, Honolulu International

[4] Table 21-3, Master Use Table, Chapter 21.

Airport, Honolulu Harbor, Downtown Honolulu, and University of Hawai‘i John A. Burns School of Medicine. The exceptions are the part of the airport reef runway and an islet off of Sand Island; these locations are designated as conservation. See Figure 3.5-19 for land use designations for the Pearl Harbor landing site area.

A substantial portion of the landing site area contains zoning designations in which application for discretionary approval for a converter station may be submitted for consideration. See Figure 3.5-20 for zoning information in the landing site area.

State Waters

Submerged lands off of JBPHH are under the administration of the U.S. government.

Submerged lands in the state of Hawai‘i are within the conservation use district, and as such are regulated by DLNR. Harbor use at the state’s 10 harbors is under the administration of the State Department of Transportation, Harbor Division. The landing site area contains Honolulu Harbor.

See Figure 3.5-21 for major landowners and private parcels in the Pearl Harbor landing site area.

<u>Federal Waters</u>

BOEM Jurisdiction

A foreseeable “use” of the federal waters under BOEM jurisdiction includes the installation of a cable. A BOEM-issued ROW grant is required for the length of the offshore cable that would pass beyond the state nearshore waters off of individual islands and into federal waters (BOEM 2012).

NOAA Jurisdiction

The existing “use” in the federal waters under the NOAA jurisdiction is composed of the humpback whale sanctuary. Regulations are in place to protect humpback whales in the sanctuary and also apply anywhere within Hawaiian waters per the Endangered Species Act. Enforcement of these regulations are coordinated by the NOAA Office of Law Enforcement (OLE) with the U.S. Coast Guard (USCG), State of Hawai‘i DLNR Division of Conservation and Resource Enforcement (DOCARE), and the NOAA Office of General Counsel.

3.5.5 Potential Impacts of Cable System Implementation

Description of Impact Types

Consistency with the existing regulations

If conformity with the existing regulation cannot be made due to the absence of land or land with the desired land use designation, it may be necessary to seek reclassification of land through the State Land Use Commission, rezoning and/or seeking a land use variance with respective county governments.

Activities associated with the cable laying and HDD are permitted uses in state waters in the conservation use district.

Degree of impact

A project found to be consistent with existing regulations could still be found to have an impact on the surrounding land use. For example, a converter station sited adjacent to residential parcels could be considered to have a greater degree of impact than being sited adjacent to an industrial activity.

The criteria for impact and degree of impact discussed above do not apply for existing DoD properties at MCBH at Kāneʻohe Bay and JBPHH, which is at the discretion of the Base Command approval.

Maui County-Oʻahu Routing Specific Description of Impact Types

Maui

Maui-Kahului Harbor

Terrestrial

Regarding the state land use districts, the landing site area contains limited locations where a converter station could be sited—the northwestern tip and a sliver of property on a stream in Wailuku. An alternative would be to consider properties zoned P under county zoning. P zones are located primarily in the Kahului Harbor portion of the landing site area. The degree of impact would depend on where a converter station is sited. P zones abutting the existing harbor use would have less impact on the surrounding uses than those situated next to single/multi-family residential areas (landward side of Kahului where Routes 32 and 26 meet).

State Waters

The proposed activity is a permitted use in state waters.

Maui-Kapalua (West Maui)

Terrestrial

The landing site area contains areas under agricultural use districts. While the northeastern portion of the landing site area currently accommodates agricultural activities, the middle portion of the landing site area is developed with a golf course. Consideration of lands under county zoning is not a viable alternative; such parcels contain characterization as small, scattered, and marginal properties along the coast.

State Waters

The proposed activity is a permitted use in state waters.

Lānaʻi

Terrestrial

The project component is not an allowed use in the landing site area. Because the landing site area and its surroundings are of the same use designation, an alternative would be to seek a use variance and/or reclassification of the lands under consideration.

State Waters

The proposed activity is a permitted use in state waters.

Molokaʻi

Molokaʻi-Kaluakoi (West Molokaʻi)

Terrestrial

A substantial part of the landing site area is under an agricultural use district. The project component is an allowed use throughout the landing site area. Most of the landing site area is under agricultural use and its surrounding area is currently undeveloped.

State Waters

The proposed activity is a permitted use in state waters.

Molokaʻi-Kaunakakai (South Molokaʻi)

Terrestrial

The entire landing site area is under the agricultural use district. The project component is an allowed use throughout the landing site area.

State Waters

The proposed activity is a permitted use in state waters.

<u>Oʻahu</u>

Oʻahu-MCBH at Kāneʻohe Bay

Terrestrial

The landing site area does not contain any agricultural use district. Although an alternative would be to use county-zoned properties, the area is densely developed and nearly built out.

State Waters

On-base, the Base Command exercises discretion with regard to permitted activities in the submerged lands. Outside of the base, the proposed activity is a permitted use in state waters.

Oʻahu-Pearl Harbor

Terrestrial

The landing site area does not contain any agricultural use district. An alternative would be to use county-zoned properties in the landing site area. A substantial portion of the landing site area contains use zones that permit the use of the the types of structures that would likely be constructed under any given specific project (subject to discretionary plan approvals).

State Waters

On-base, the Base Command exercises discretion with regard to permitted activities in the submerged lands. Outside of the base, the proposed activity is a permitted use in state waters.

Federal Waters

BOEM Jurisdiction

Installation of a cable is a permitted “use” in the federal waters under BOEM jurisdiction, provided that conditions required in BOEM’s ROW permit are satisfied.

NOAA Jurisdiction

Activity in the whale sanctuary for the installation of a cable could potentially temporarily disrupt the existing “use” as a whale sanctuary, as animals would likely avoid the area near the activity during construction. Depending on where the cable corridor is sited and when construction activities were to occur, the extent of potential impacts could vary. The waters off of the Maui-Kahului Harbor landing site area are outside of the whale sanctuary, while all of Moloka‘i’s south side is within the whale sanctuary boundary; the temporary impact on the whale sanctuary could vary from minimal (Kahului Harbor landing site area) to potentially significant (Moloka‘i’s Kaunakakai and Kaluakoi landing site areas). There would be no disruption of use during cable operation.

3.5.6 General Siting Criteria and Special Conservation and Construction Measures

General Level Special Conservation and Construction Conservation and Construction Measures

Siting Criteria

LU-1 Development should be sited to minimize displacement of existing uses.

LU-2 To minimize impact to the existing whale sanctuary, the NOAA OLE with the USCG, DOCARE, and the NOAA Office of General Counsel should be consulted to determine specific siting of cable corridor and timing of activities.

In addition to land use, the following guidelines apply to all components of the undersea power cable system.

Coastal Zone Management (HRS Chapter 205A-2)

CZ-1 Recreational resources: Provide coastal recreational opportunities accessible to the public. Refer to Section 3.12 for an in-depth look at recreational resources.

CZ-2 Historic resources: Protect, preserve, and, where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture. Refer to Section 3.2 for an in-depth look at cultural resources.

CZ-3 Scenic and open space resources: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources. Refer to Section 3.15 for an in-depth look at visual resources.

CZ-4 Coastal ecosystem: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems. Refer to Section 3.14 for an in-depth look at terrestrial/coastal biological resources, species, and habitat.

CZ-5 Economic uses: Provide public or private facilities and improvements important to the state's economy in suitable locations. Refer to Section 3.13 for an in-depth look at socioeconomics and environmental justice.

CZ-6 Coastal hazards: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution. Refer to Section 3.8 for an in-depth look at natural hazards.

CZ-7 Managing development: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

CZ-8 Public participation: Stimulate public awareness, education, and participation in coastal management.

CZ-9 Beach protection: Protect beaches for public use and recreation. Refer to Section 3.12 for an in-depth look at recreational resources.

CZ-10 Marine resources: Promote the protection, use, and development of marine and coastal resources to ensure their sustainability. Refer to Section 3.7 for an in-depth look at marine/benthic resources, species, and Section 3.14 for an in-depth look at habitat and terrestrial/coastal, biological resources, species, and habitat.

Special Management Area

SMA-1 All development in the SMA shall be subject to reasonable terms and conditions set by the authority in order to ensure:

a. Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles.

b. Adequate and properly located public recreation areas and wildlife preserves are reserved.

c. Provisions are made for solid and liquid waste treatment, disposition, and management, which will minimize adverse effects upon special management area resources.

d. Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, wind damage, storm surge, landslides, erosion, siltation, or failure in the event of earthquake.

SMA-2 No development shall be approved unless the authority has first found:

a. That the development will not have any substantial adverse environmental or ecological effect, except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health, safety, or compelling public interests. Such adverse effects shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect, and the elimination of planning options.

b. That the development is consistent with the objectives, policies, and special management area guidelines of this chapter and any guidelines enacted by the legislature.

c. That the development is consistent with the county general plan and zoning. Such a finding of consistency does not preclude concurrent processing where a general plan or zoning amendment may also be required.

SMA-3 The authority shall seek to minimize, where reasonable:

a. Dredging, filling, or otherwise altering any bay, estuary, salt marsh, river mouth, slough, or lagoon.

b. Any development that would reduce the size of any beach or other area usable for public recreation.

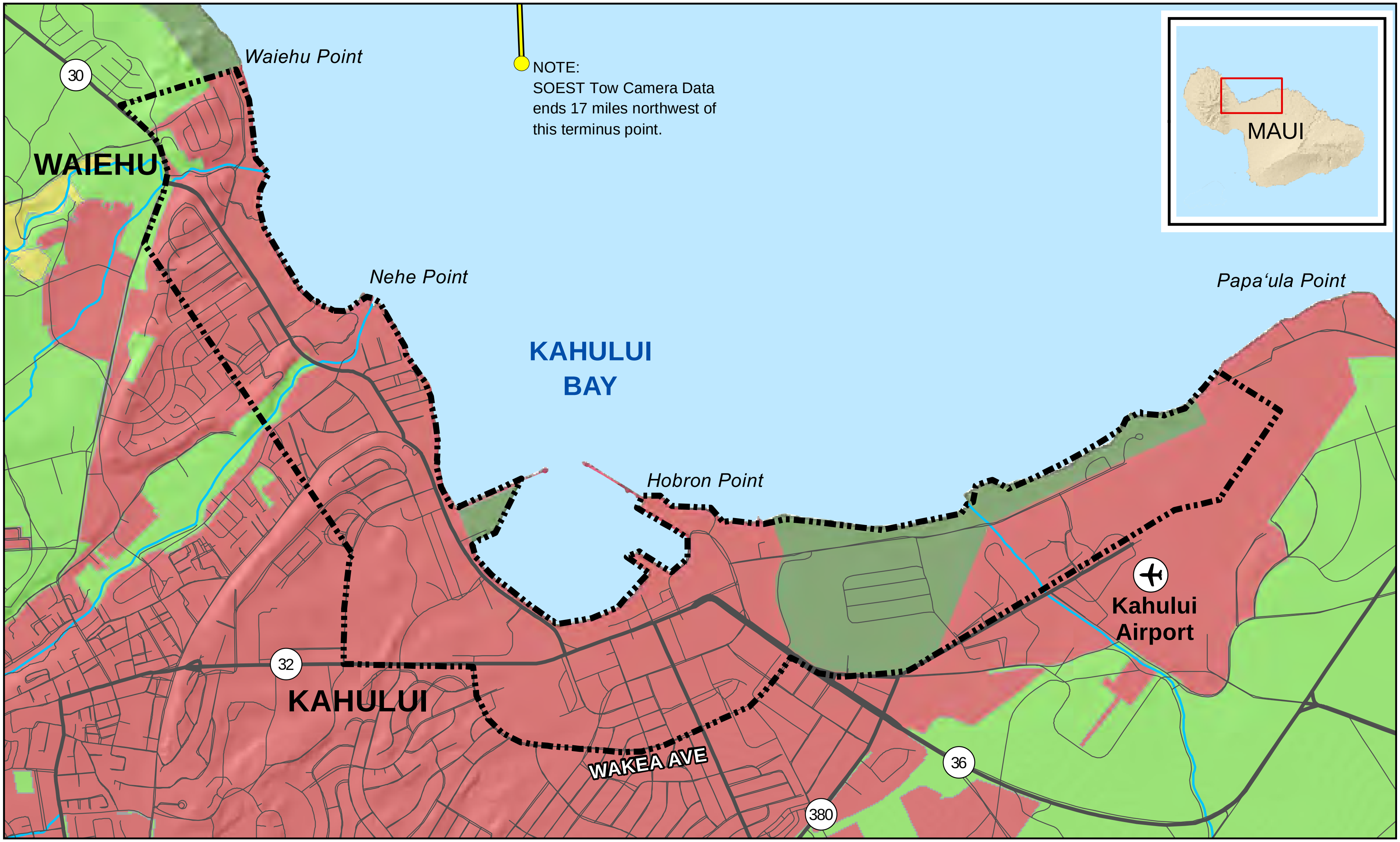
c. Any development that would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management areas, and the mean high tide line where there is no beach.

d. Any development that would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast.

e. Any development that would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.

Maui County-Oʻahu Routing Specific Special Conservation and Construction Measures

In all routing cases and locations, for both terrestrial areas and in coastal and marine waters, the general measures described above should be implemented.



Kahului Maui Landing Site Area: State Land Use Districts

- Route with camera data *
- Route without camera data **
- Highways & Major Roads
- Other Roads
- SOEST Cable Routes
- HIREP Study Analysis Area

State Land Use Districts (2011)

- Urban Land Use District
- Rural Land Use District
- Agriculture Land Use District
- Conservation Land Use District

- Drainages, Rivers and Streams
- Open Water

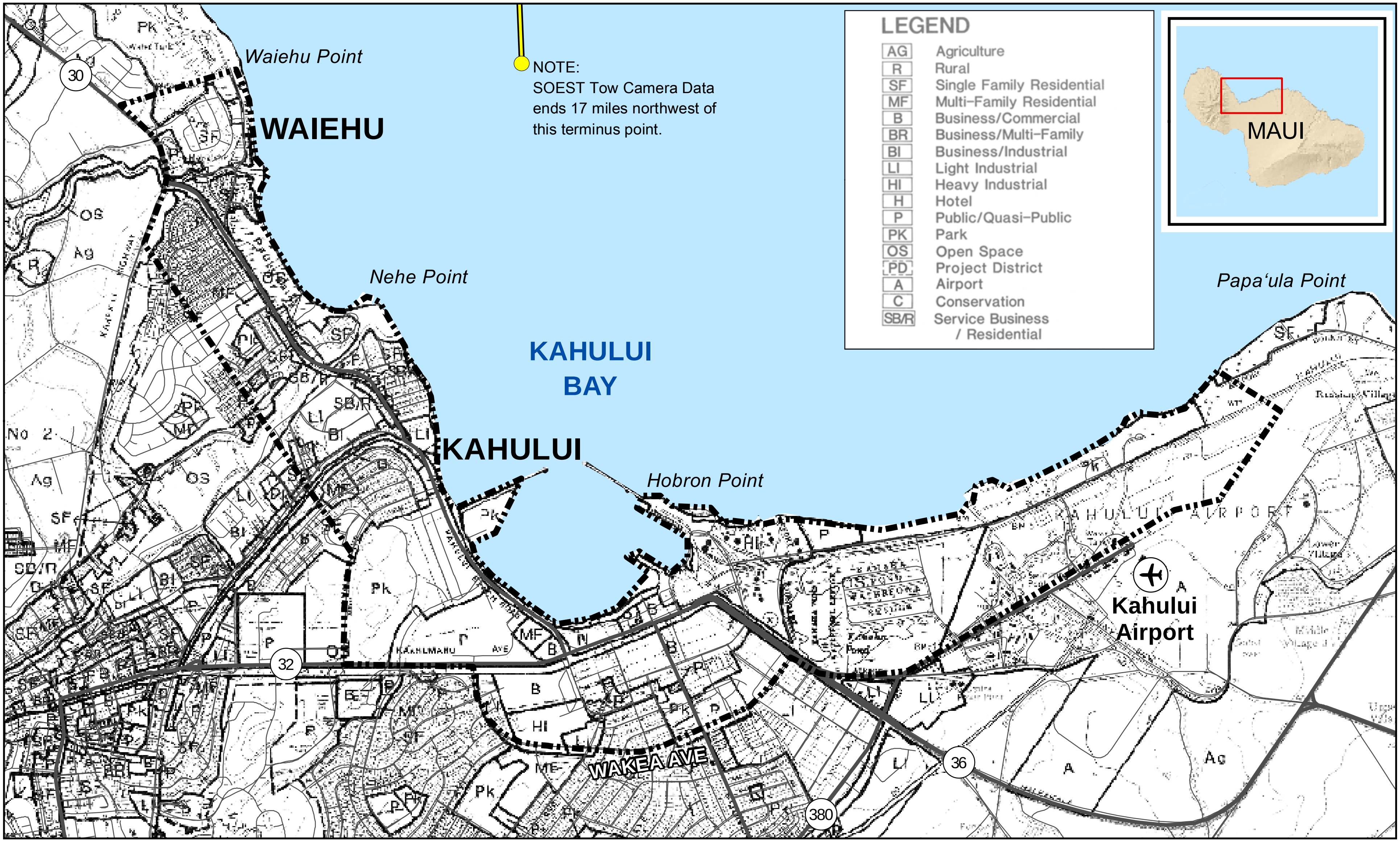
N

0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

Date: 4/28/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-1



Kahului Maui Landing Site Area: Maui County Community Plans ***

- Route with camera data *
- Route without camera data **
- Highways & Major Roads
- Other Roads
- SOEST Cable Routes
- HIREP Study Analysis Area
- Open Water

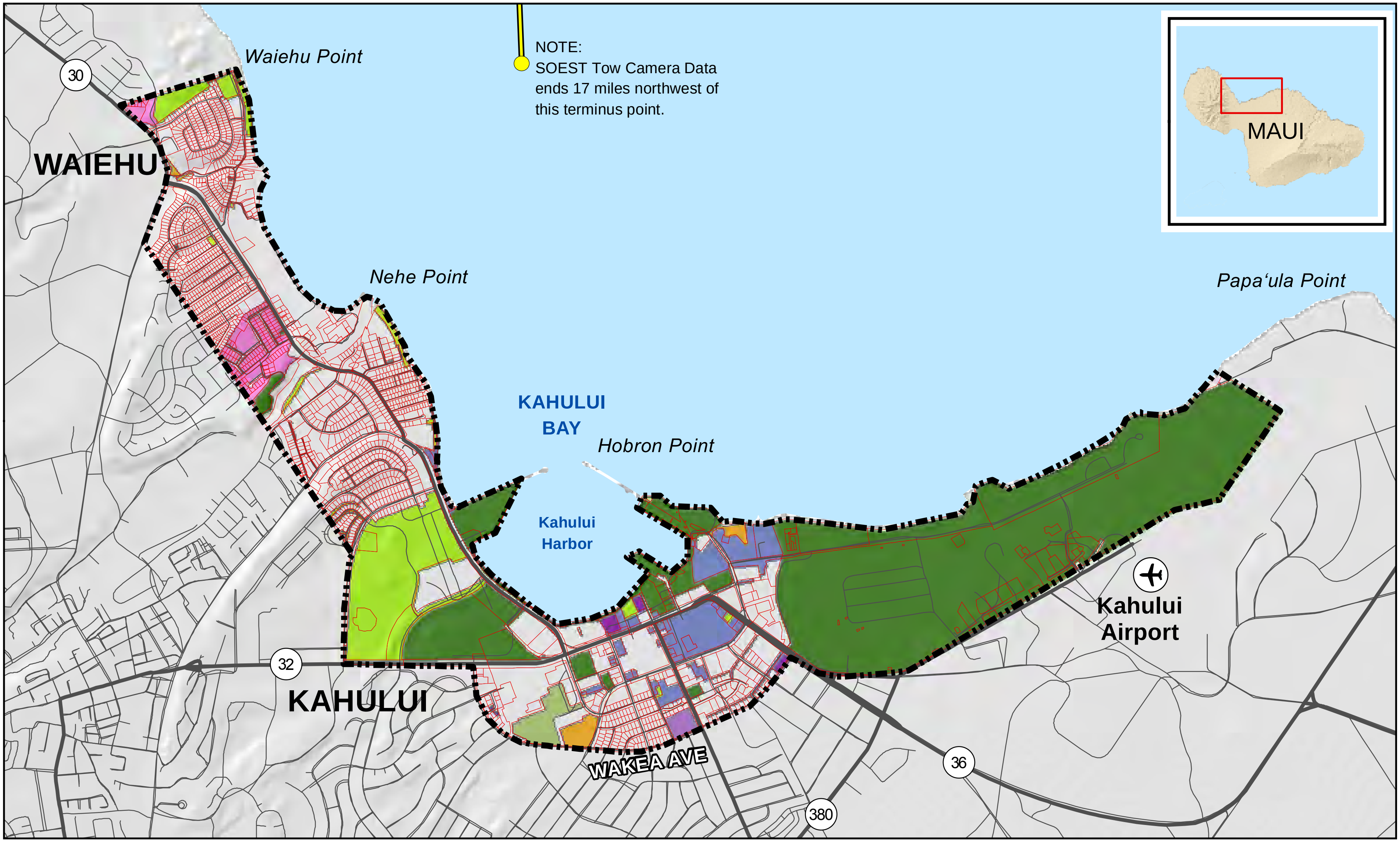
N

0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Maui County (Maui, Lānaʻi, and Molokaʻi) zoning data is not available in digital GIS format. In lieu of this, a paper verison of the Maui Community Plan was referenced to an approx. location and shown as provided by Maui Co. This does NOT represent zoning.

Date: 4/26/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-2



Kahului Maui Landing Site Area: Major Landowners and Private Parcels ***

Route with camera data *
Route without camera data **
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
Open Water
Maui TMK Parcels (2011)

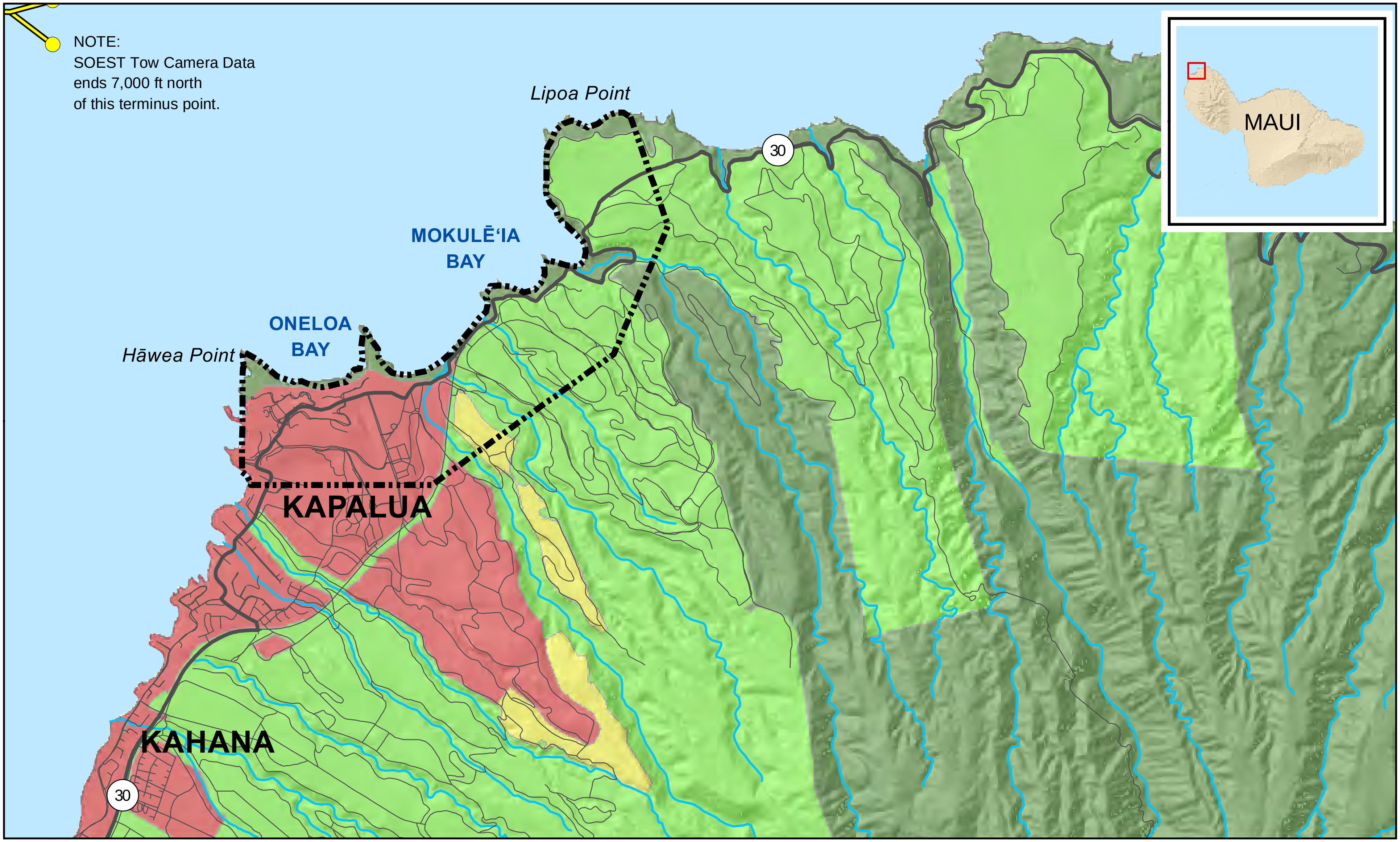
Major Landowners (2011)
U.S. Government
State of Hawaiʻi
State Dept. of Hawaiian Homelands (DHHL)
County of Maui
Hawaiian Electric Company (HECO)
HRT
Roman Catholic Church
Alexander & Baldwin
Maui Land & Pine
Finance Factors Ltd

N
0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the entire parcel boundary.

Date: 4/26/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-3



West Maui Landing Site Area: State Land Use Districts

Route with camera data *
Route without camera data **
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area

State Land Use Districts (2011)
Urban Land Use District
Rural Land Use District
Agriculture Land Use District
Conservation Land Use District

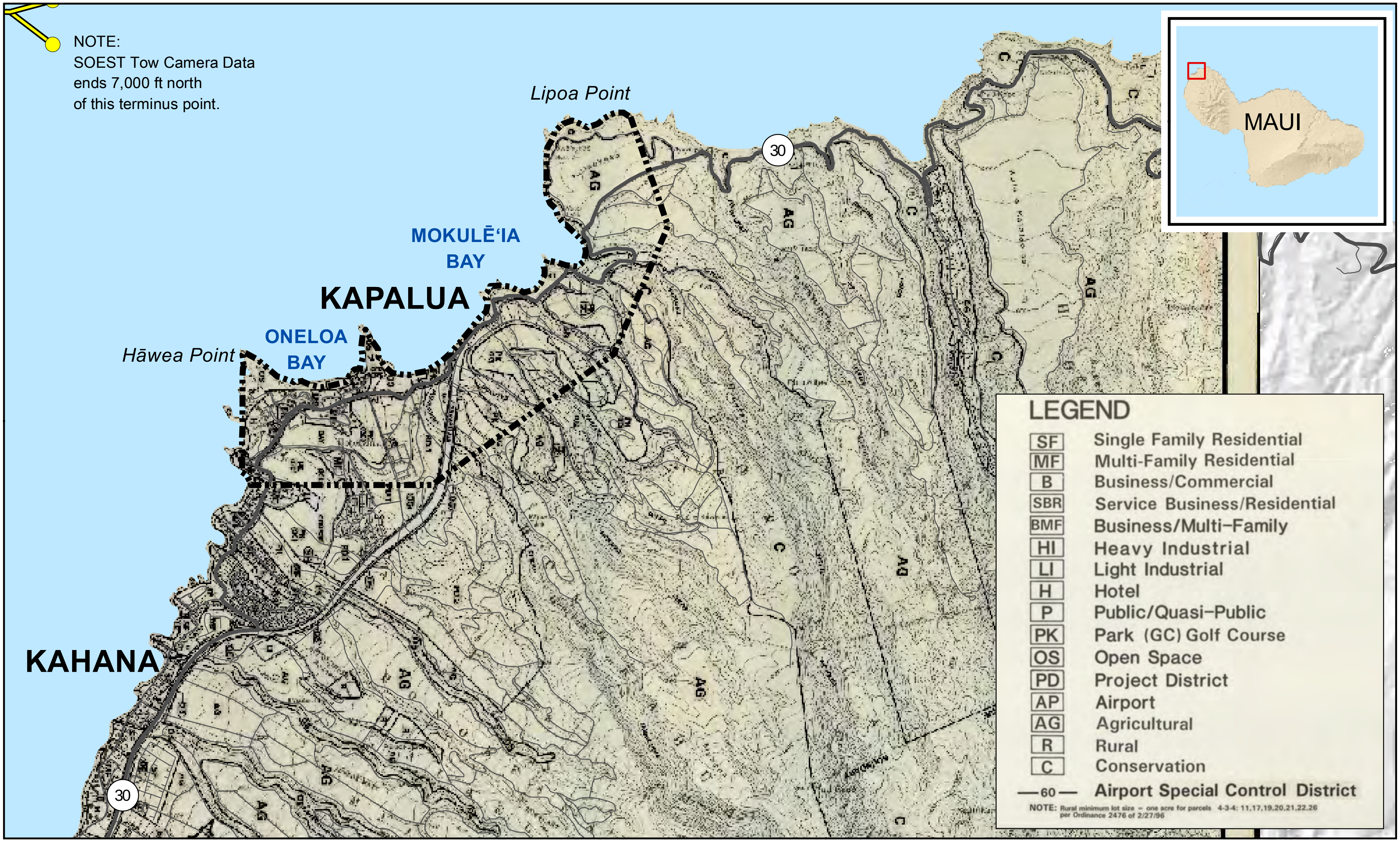
Drainages, Rivers and Streams
Open Water

N
0 2,500
Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

Date: 4/26/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-4



West Maui Landing Site Area: Maui County Community Plans ***

Route with camera data *
Route without camera data **
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
Open Water

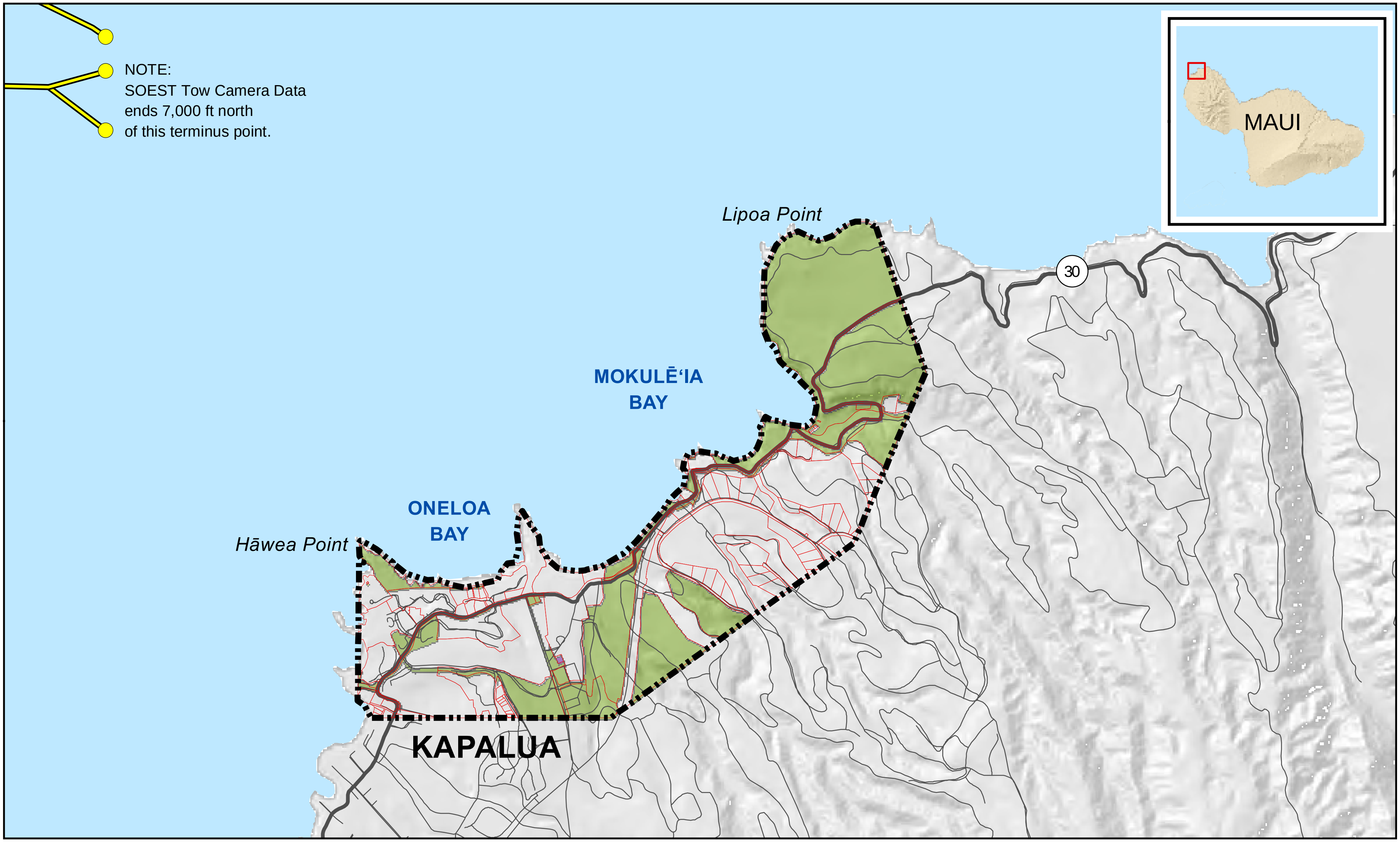
N

0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Maui County (Maui, Lānaʻi, and Molokaʻi) zoning data is not available in digital GIS format. In lieu of this, a paper verison of the Maui Community Plan was referenced to an approx. location and shown as provided by Maui Co. This does NOT represent zoning.

Date: 4/26/2012
Data Sources: HI-DBEDT, MAUI CO, UH-SOEST, AECOM, 2012

Figure 3.5-5



West Maui Landing Site Area: Major Landowners and Private Parcels ***

- Route with camera data *
- Route without camera data **
- Highways & Major Roads
- Other Roads
- SOEST Cable Routes
- HIREP Study Analysis Area
- Open Water
- Maui TMK Parcels (2011)

Major Landowners (2011)

- U.S. Government
- Maui Land & Pine
- Roman Catholic Church

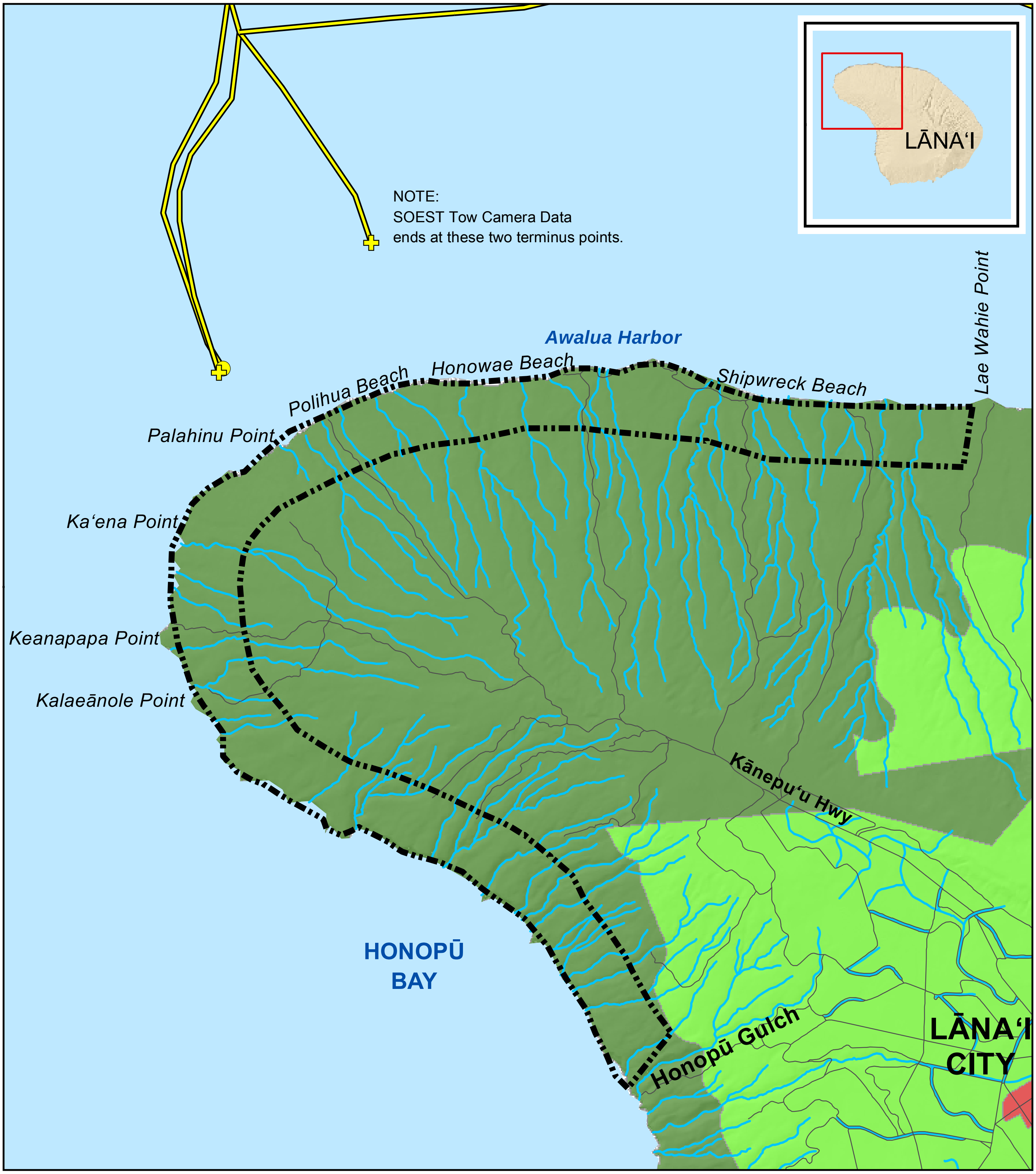
N

0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the full parcel boundary.

Date: 4/26/2012
Data Sources: HI-DBEDT, Maui Co., UH-SOEST, AECOM, 2012

Figure 3.5-6



Lānaʻi Landing Site Area: State Land Use Districts

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

Date: 4/26/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-7

Lāna‘i Landing Site Area: Maui County Community Plans ***

Route with camera data *

Route without camera data **

Highways & Major Roads

Other Roads

SOEST Cable Routes

HIREP Study Analysis Area

Open Water

N

0 5,000 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).

** Symbol denotes shoreward approach of cable route without tow camera data.

*** Maui County (Maui, Lāna‘i, and Moloka‘i) zoning data is not available in digital GIS format. In lieu of this, a paper verison of the Maui Community Plan was referenced to an approx. location and shown as provided by Maui Co. This does NOT represent zoning.

Date: 4/26/2012

Data Sources: HI-DBEDT, MAUI CO, UH-SOEST, AECOM, 2012

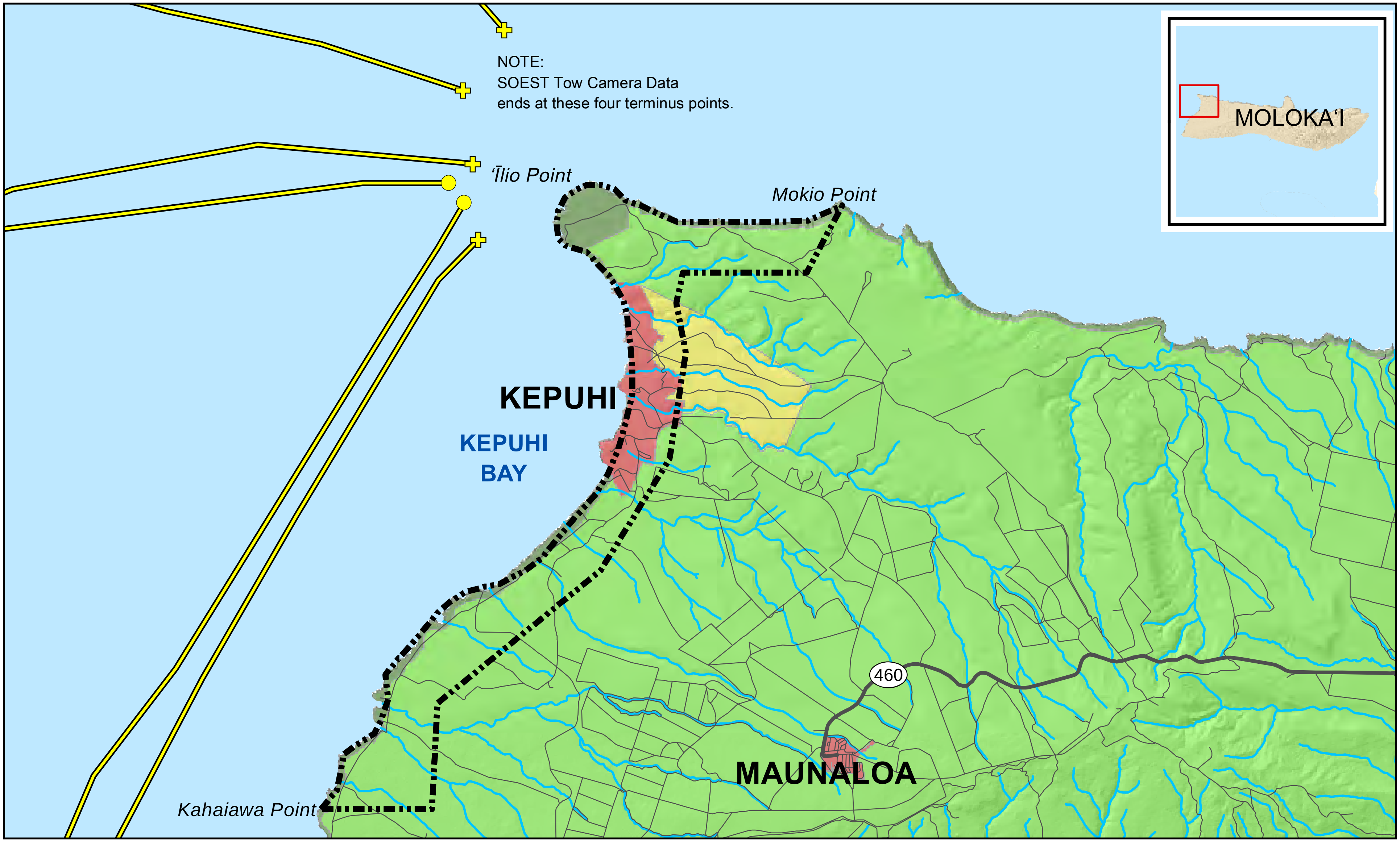
Figure 3.5-8

Lānaʻi Landing Site Area: Major Landowners and Private Parcels ***

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the full parcel boundary.

Date: 4/28/2012
Data Sources: HI-DBEDT, Maui Co., UH-SOEST, AECOM, 2012

Figure 3.5-9



West Molokaʻi Landing Site Area: State Land Use Districts

Route with camera data *
Route without camera data **
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area

State Land Use Districts (2011)
Urban Land Use District
Rural Land Use District
Agriculture Land Use District
Conservation Land Use District

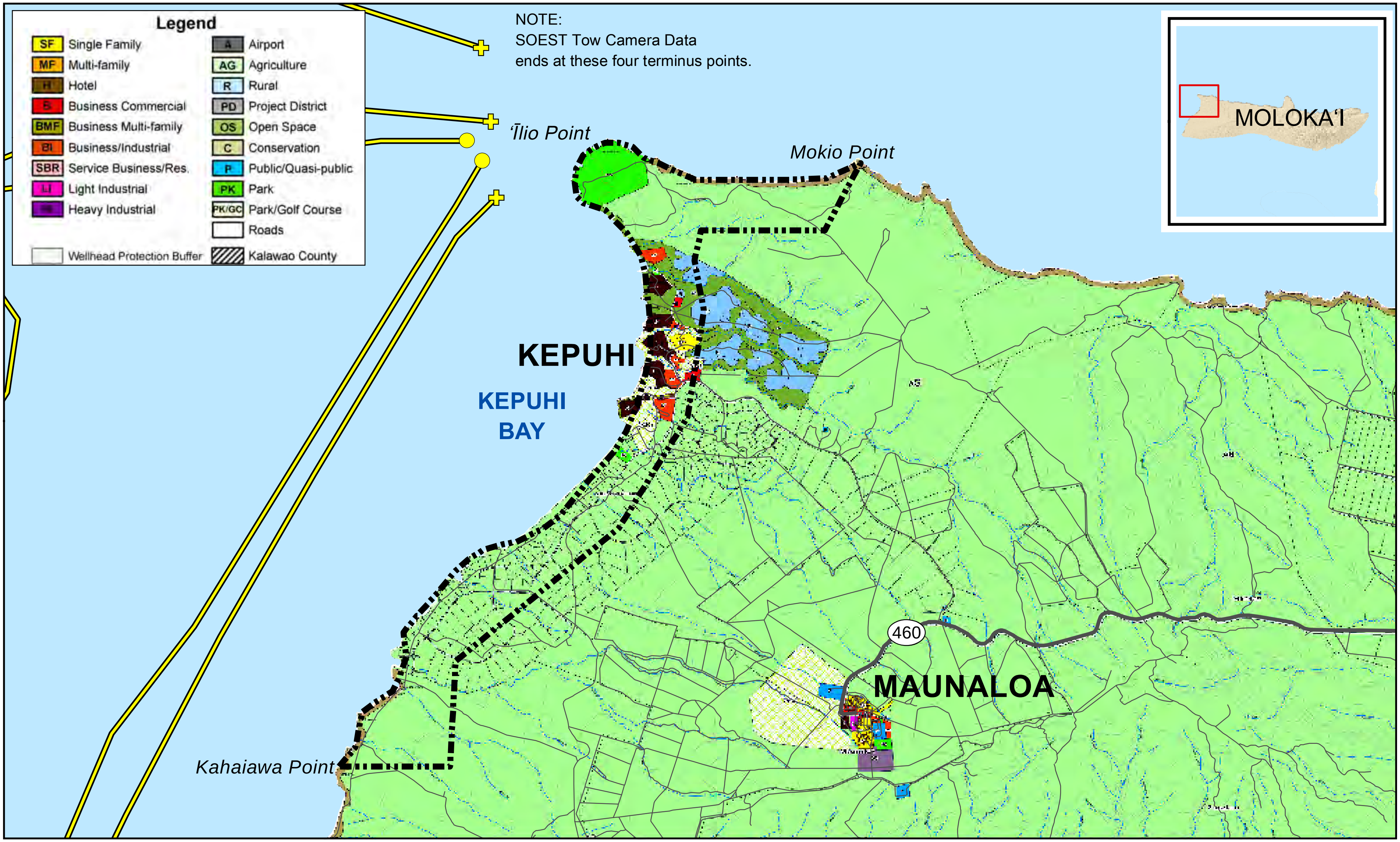
Drainages, Rivers and Streams
Open Water

N
0 5,000
Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

Date: 4/26/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-10

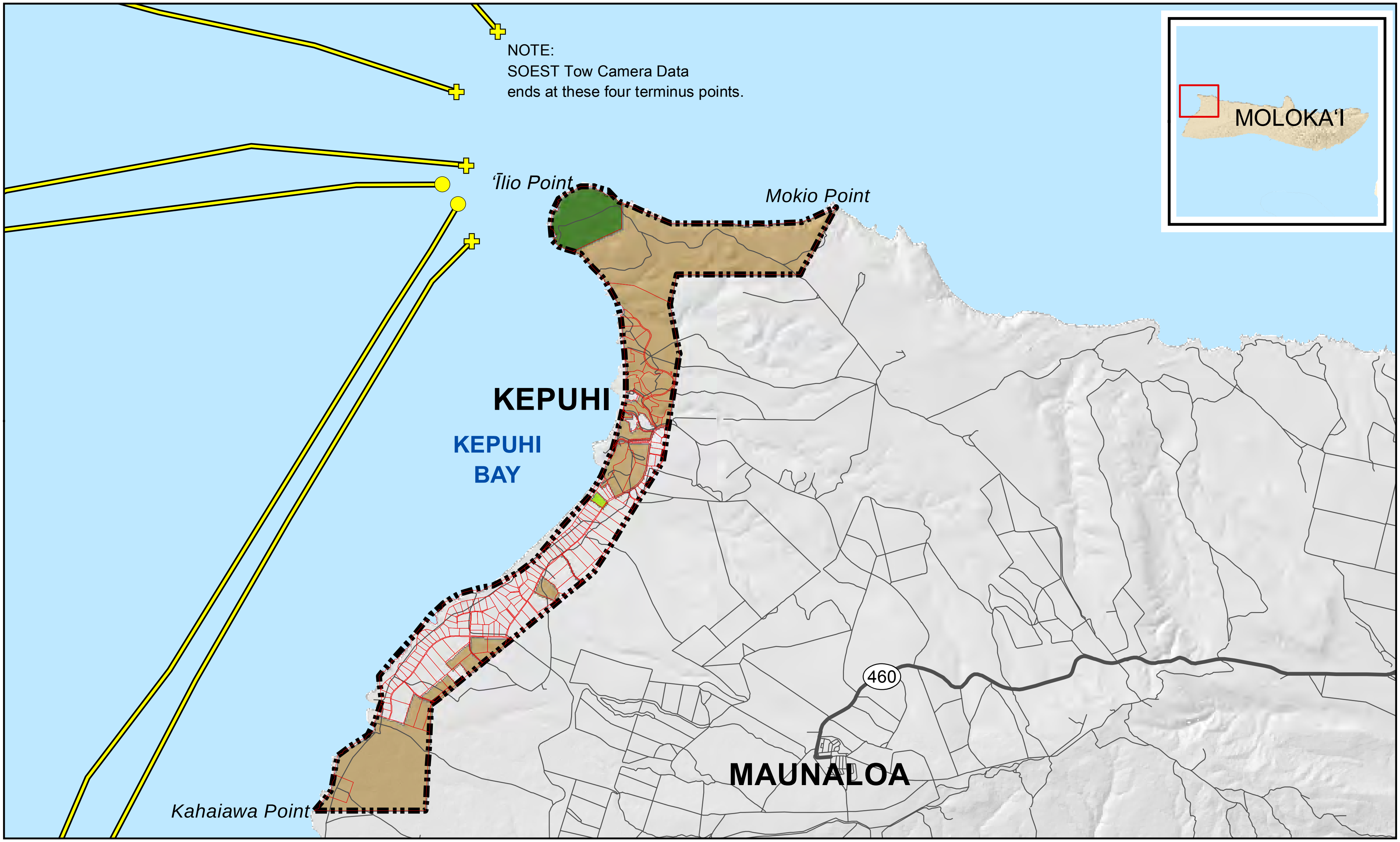


West Molokaʻi Landing Site Area: Maui County Community Plans ***

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Maui County (Maui, Lānaʻi, and Molokaʻi) zoning data is not available in digital GIS format. In lieu of this, a paper verison of the Maui Community Plan was referenced to an approx. location and shown as provided by Maui Co. This does NOT represent zoning.

Date: 4/26/2012
Data Sources: HI-DBEDT, Maui Co., UH-SOEST, AECOM, 2012

Figure 3.5-11



West Molokaʻi Landing Site Area: Major Landowners and Private Parcels ***

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the full parcel boundary.

Date: 4/28/2012
Data Sources: HI-DBEDT, Maui Co., UH-SOEST, AECOM, 2012

Figure 3.5-12

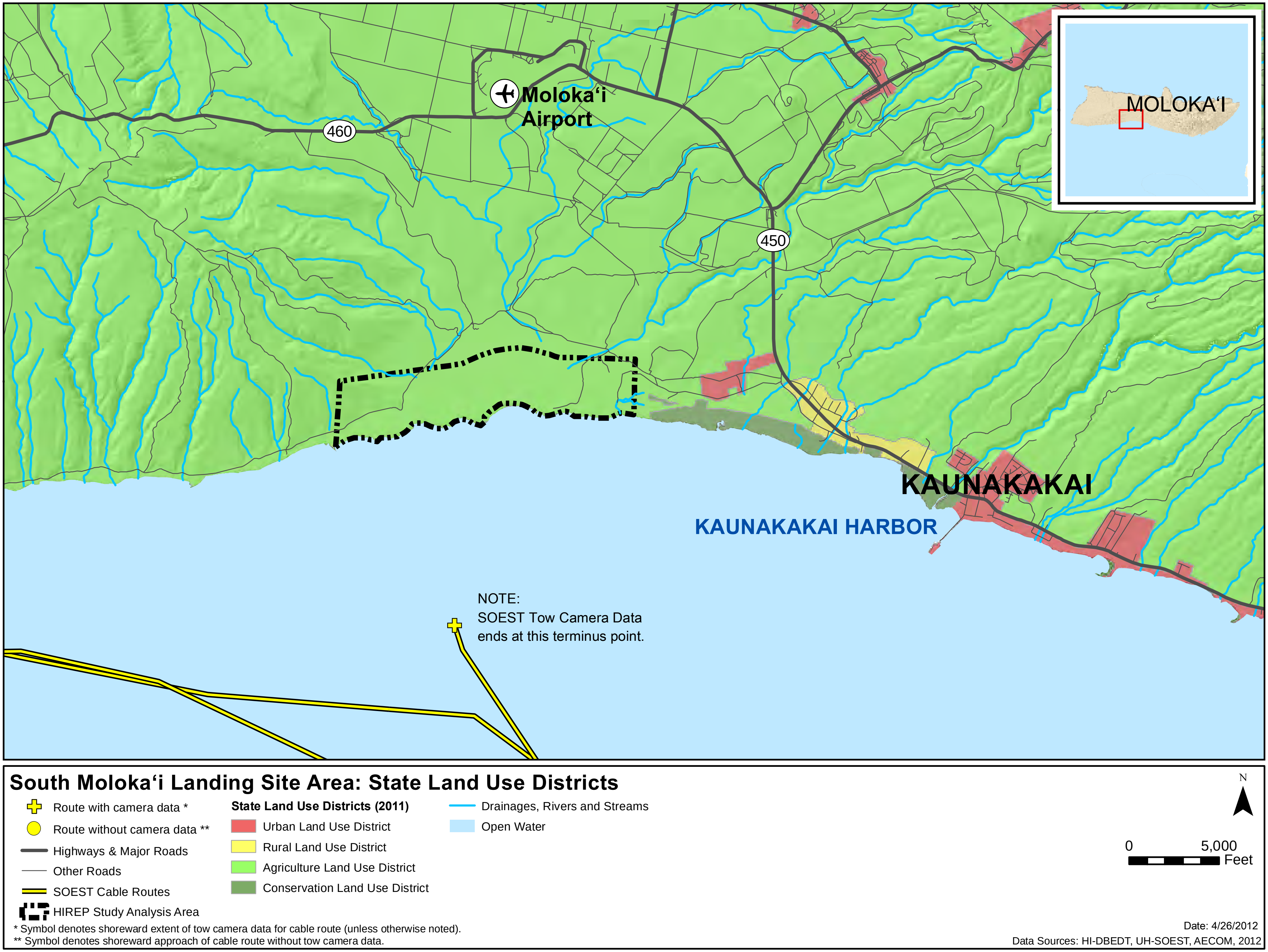
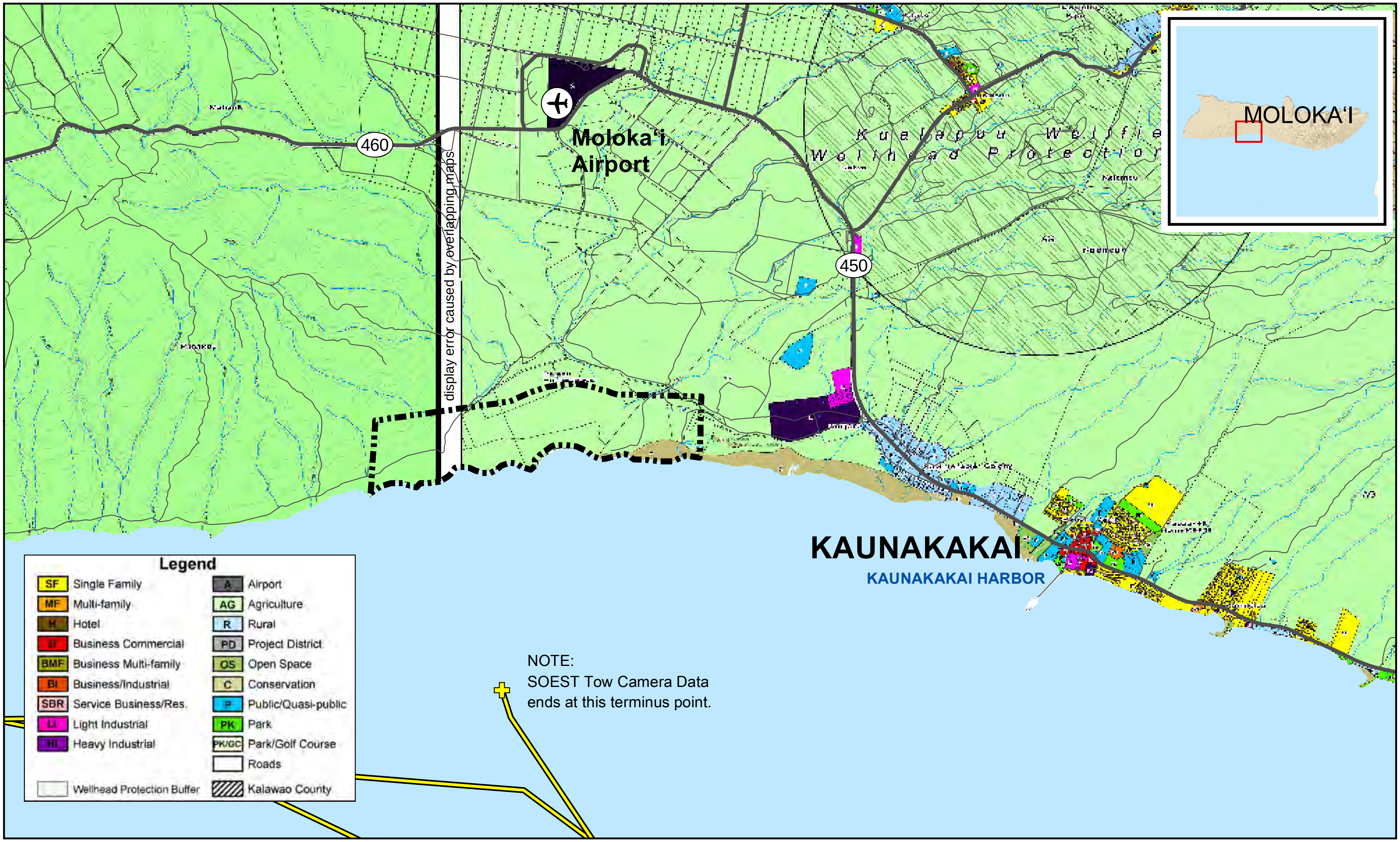

Moloka'i Airport
460
450
MOLOKA'I
KAUNAKAKAI
KAUNAKAKAI HARBOR
NOTE:
SOEST Tow Camera Data
ends at this terminus point.
South Moloka'i Landing Site Area: State Land Use Districts
Route with camera data *
Route without camera data **
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
State Land Use Districts (2011)
Urban Land Use District
Rural Land Use District
Agriculture Land Use District
Conservation Land Use District
Drainages, Rivers and Streams
Open Water
N
0
5,000
Feet
* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
Date: 4/26/2012
Data Sources: HI-DBEDT, UH-SOEST, AECOM, 2012

Figure 3.5-13



South Moloka'i Landing Site Area: Maui County Community Plans ***

- Route with camera data *
- Route without camera data **
- Highways & Major Roads
- Other Roads
- SOEST Cable Routes
- HIREP Study Analysis Area
- Open Water

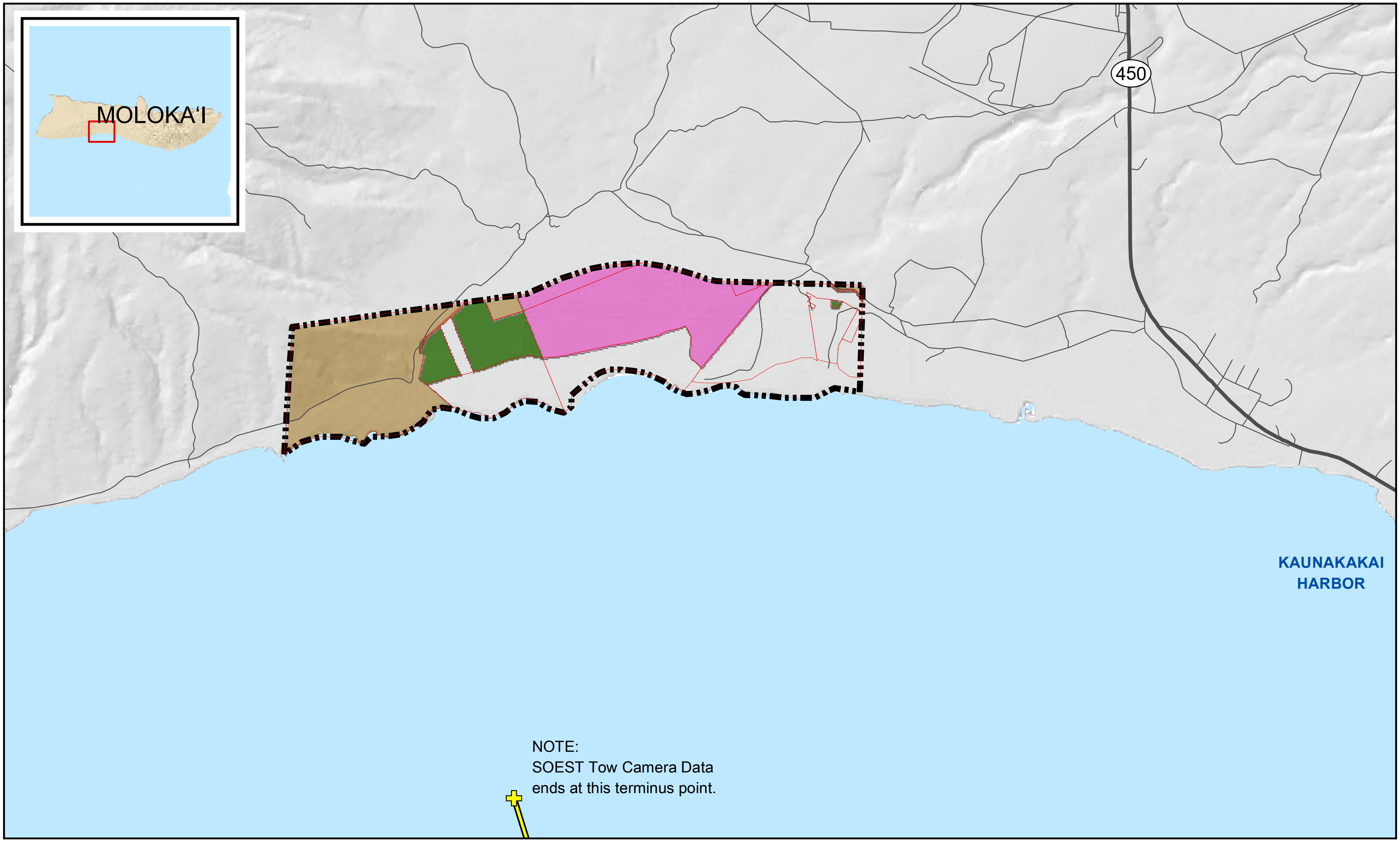
N

0 5,000 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Maui County (Maui, Lāna'i, and Moloka'i) zoning data is not available in digital GIS format. In lieu of this, a paper verison of the Maui Community Plan was referenced to an approx. location and shown as provided by Maui Co. This does NOT represent zoning.

Date: 4/26/2012
Data Sources: HI-DBEDT, MAUI CO, UH-SOEST, AECOM, 2012

Figure 3.5-14



South Moloka'i Landing Site Area: Major Landowners and Private Parcels ***

Route with camera data *
Route without camera data **
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
Open Water
Moloka'i TMK Parcels (2011)

Major Landowners (2011)

State of Hawai'i
State Dept. of Hawaiian Homelands (DHHL)
Moloka'i Ranch

N
0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the full parcel boundary.

Date: 4/26/2012
Data Sources: HI-DBEDT, Maui Co., UH-SOEST, AECOM, 2012

Figure 3.5-15

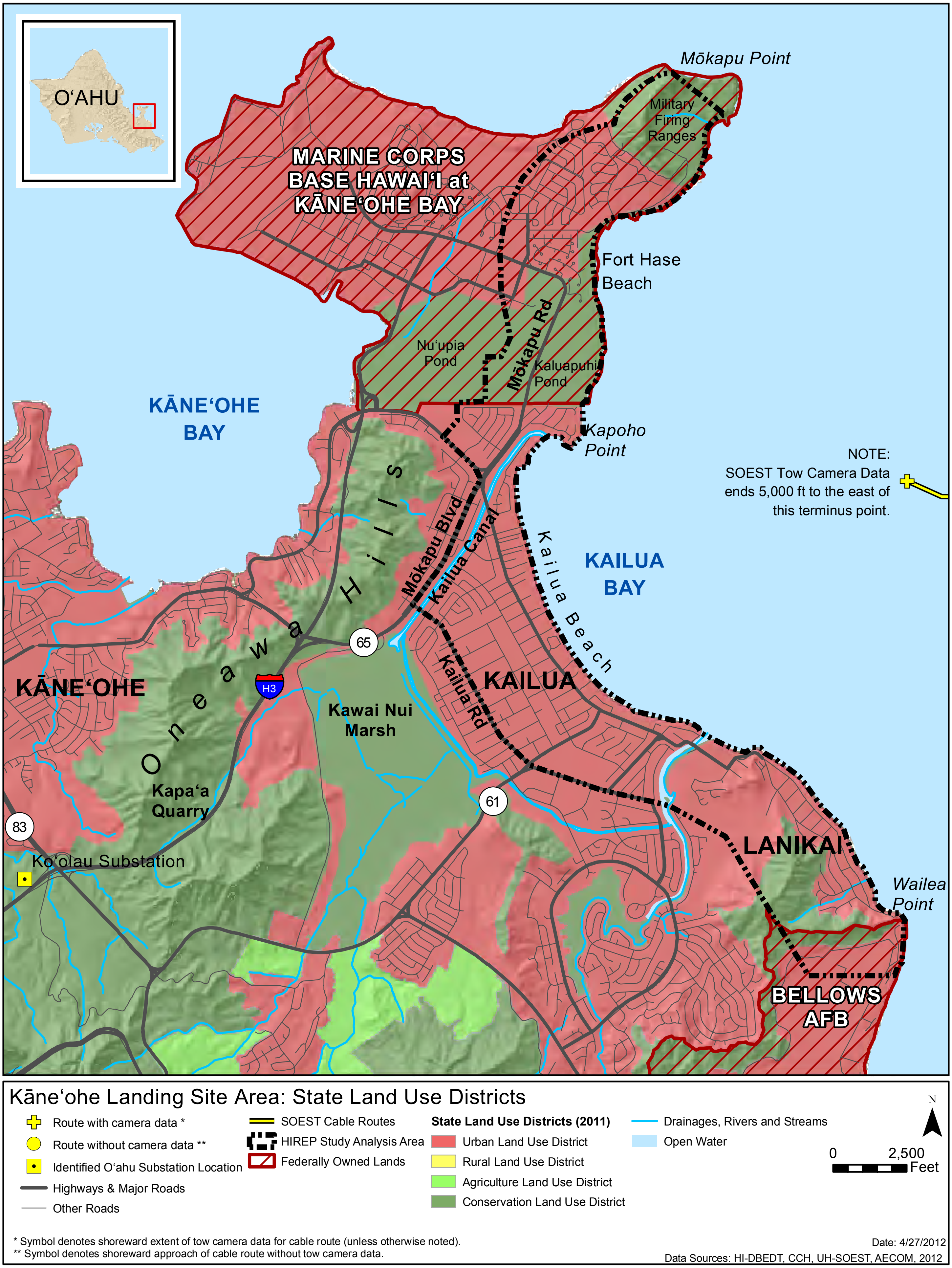
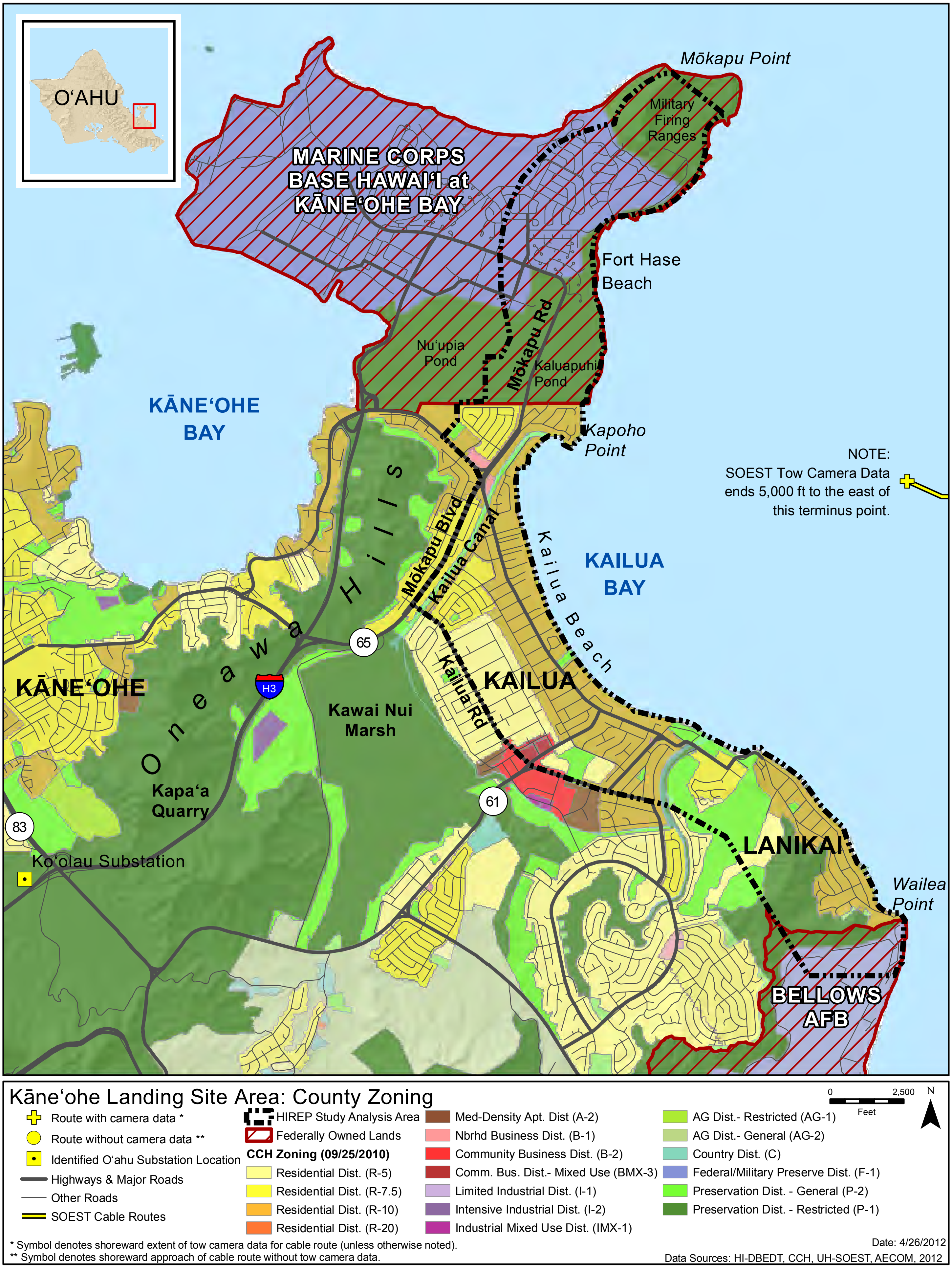
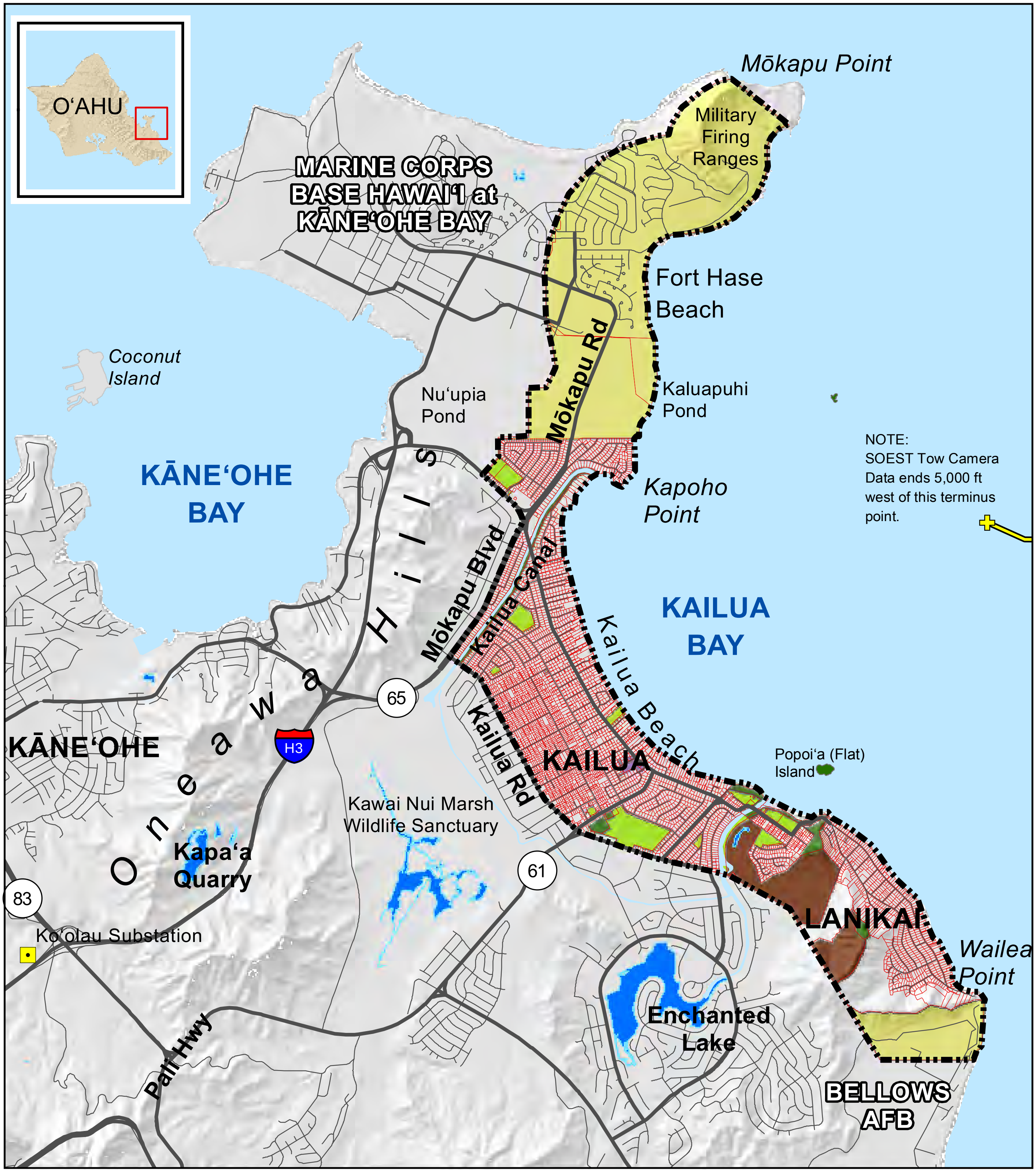

O'AHU
MARINE CORPS BASE HAWAI'I at KĀNE'OHE BAY
Mōkapu Point
Military Firing Ranges
Fort Hase Beach
Nu'upia Pond
Kaluapuhi Pond
Mōkapu Rd
KĀNE'OHE BAY
Kapoho Point
NOTE: SOEST Tow Camera Data ends 5,000 ft to the east of this terminus point.
KAILUA BAY
Oneawa Hills
Mōkapu Blvd
Kailua Canal
Kailua Beach
65
H3
KĀNE'OHE
KAILUA
Kailua Rd
Kawai Nui Marsh
Kapa'a Quarry
61
83
Ko'olau Substation
LANIKAI
Wailea Point
BELLOWS AFB
Kāne'ohe Landing Site Area: State Land Use Districts
Route with camera data *
Route without camera data **
Identified O'ahu Substation Location
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
Federally Owned Lands
State Land Use Districts (2011)
Urban Land Use District
Rural Land Use District
Agriculture Land Use District
Conservation Land Use District
Drainages, Rivers and Streams
Open Water
N
0 2,500 Feet
* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
Date: 4/27/2012
Data Sources: HI-DBEDT, CCH, UH-SOEST, AECOM, 2012

Figure 3.5-16



O'AHU
MARINE CORPS BASE HAWAI'I at KĀNE'OHE BAY
Mōkapu Point
Military Firing Ranges
Fort Hase Beach
Nu'upia Pond
Mōkapu Rd
Kaluapuhi Pond
KĀNE'OHE BAY
Kapoho Point
NOTE: SOEST Tow Camera Data ends 5,000 ft to the east of this terminus point.
Mōkapu Blvd
Kailua Canal
Kailua Beach
KAILUA BAY
Oneawa Hills
65
H3
KĀNE'OHE
Kailua Rd
KAILUA
Kawai Nui Marsh
Kapa'a Quarry
61
83
Ko'olau Substation
LANIKAI
Wailea Point
BELLOWS AFB
Kāne'ohe Landing Site Area: County Zoning
Route with camera data *
Route without camera data **
Identified O'ahu Substation Location
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
Federally Owned Lands
CCH Zoning (09/25/2010)
Residential Dist. (R-5)
Residential Dist. (R-7.5)
Residential Dist. (R-10)
Residential Dist. (R-20)
Med-Density Apt. Dist (A-2)
Nbrhd Business Dist. (B-1)
Community Business Dist. (B-2)
Comm. Bus. Dist.- Mixed Use (BMX-3)
Limited Industrial Dist. (I-1)
Intensive Industrial Dist. (I-2)
Industrial Mixed Use Dist. (IMX-1)
AG Dist.- Restricted (AG-1)
AG Dist.- General (AG-2)
Country Dist. (C)
Federal/Military Preserve Dist. (F-1)
Preservation Dist. - General (P-2)
Preservation Dist. - Restricted (P-1)
0
2,500
Feet
N
* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
Date: 4/26/2012
Data Sources: HI-DBEDT, CCH, UH-SOEST, AECOM, 2012

Figure 3.5-17



Kāne'ohe Landing Site Area: Major Landowners and Private Parcels***

Route with camera data *
Route without camera data **
Identified O'ahu Substation Location
Highways & Major Roads
Other Roads
SOEST Cable Routes
HIREP Study Analysis Area
Freshwater Lake or Pond
Open Water
O'ahu TMK Parcels

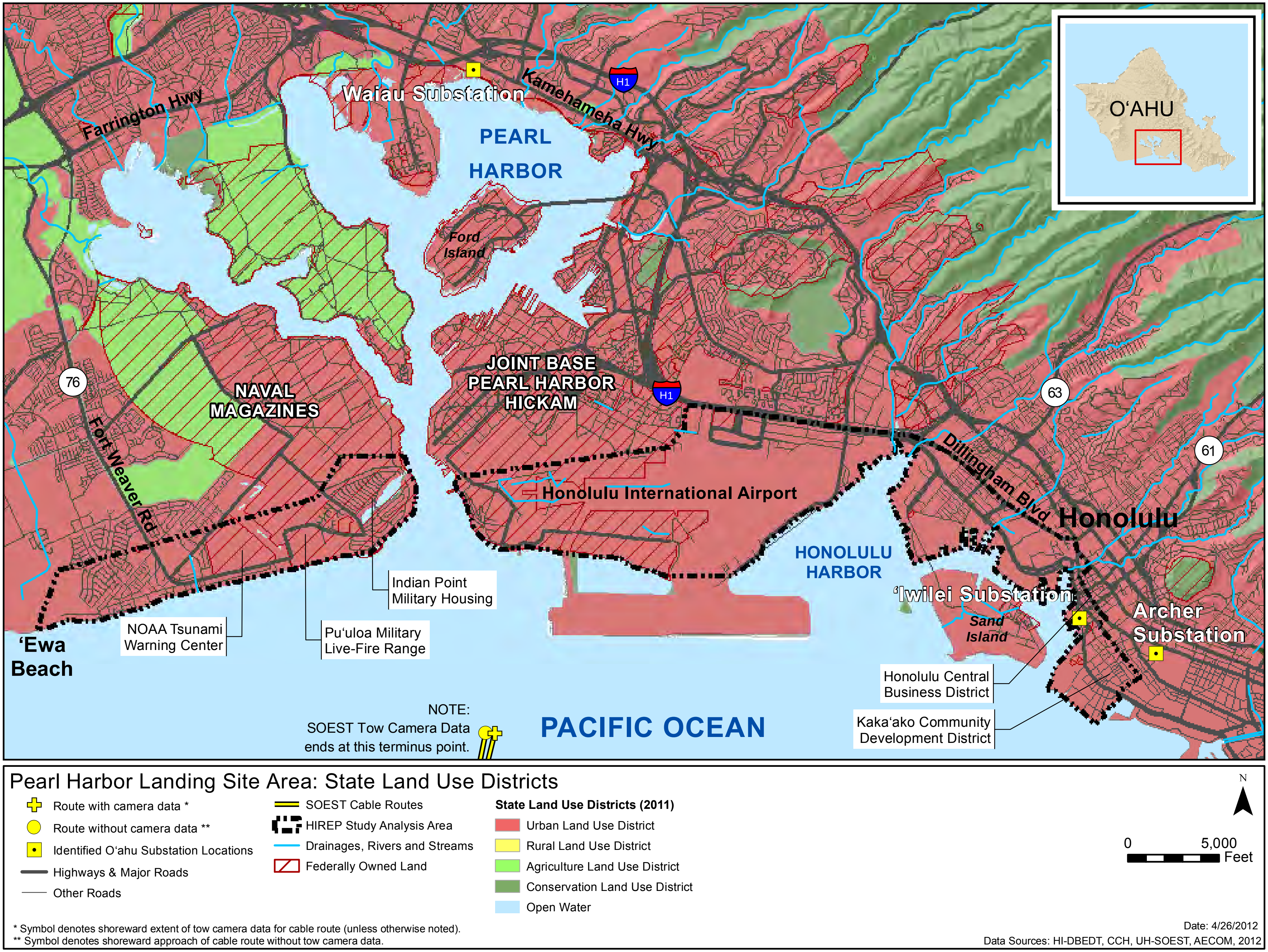
Major Landowners (2011)
U.S. Government
State of Hawai'i
City and County Honolulu (CCH)
Hawaiian Electric Company (HECO)
Kamehameha Schools
Roman Catholic Church

N
0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the full parcel boundary.

Date: 4/30/2012
Data Sources: HI-DBEDT, CCH, UH-SOEST, AECOM, 2012

Figure 3.5-18

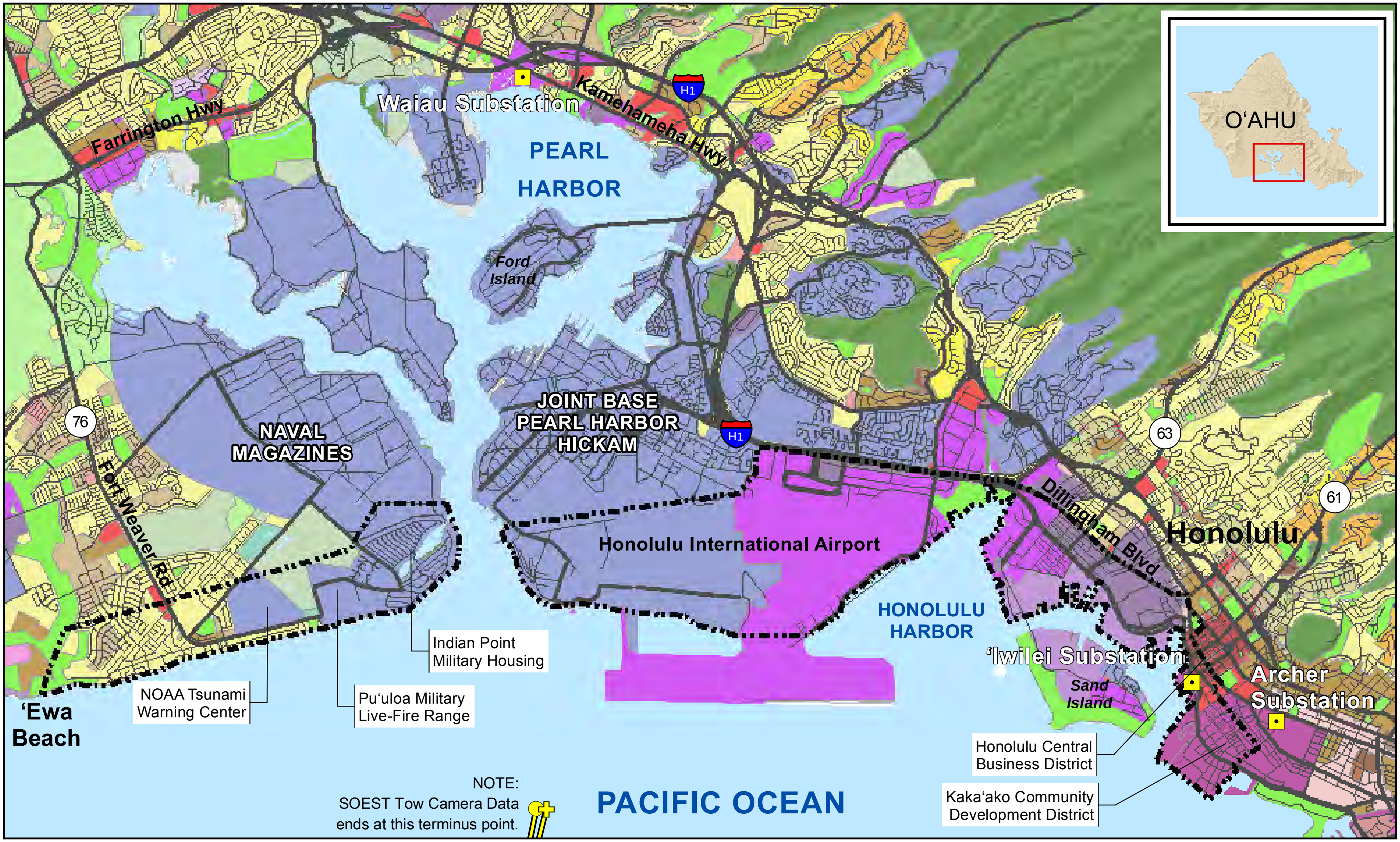


Pearl Harbor Landing Site Area: State Land Use Districts

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

Date: 4/26/2012
Data Sources: HI-DBEDT, CCH, UH-SOEST, AECOM, 2012

Figure 3.5-19



Pearl Harbor Landing Site Area: County Zoning

- Route with camera data *
- Route without camera data **
- Identified O‘ahu Substation Locations
- Highways & Major Roads
- Other Roads
- SOEST Cable Routes
- HIREP Study Analysis Area
- Open Water

CCH Zoning (9/25/2010)

- Residential Dist. (R-5)
- Residential Dist. (R-3.5)
- Residential Dist. (R-7.5)
- Residential Dist. (R-10)
- Residential Dist. (R-20)
- Low-Density Apt. Dist (A-1)
- Med-Density Apt. Dist (A-2)
- High-Density Apt. Dist (A-3)
- Low-Density Apt. Mixed Use Dist (AMX-1)
- Med-Density Apt. Mixed Use Dist (AMX-2)
- High-Density Apt. Mixed Use Dist (AMX-3)
- Apt. Mixed Use Dist - Special***
- Nbrhd Business Dist. (B-1)
- Community Business Dist. (B-2)
- Central Business Dist.- Mixed Use (BMX-4)
- Community Business Dist.- Mixed Use (BMX-3)
- Resort
- Resort-Mixed Use
- Resort-Commercial
- Special****
- Limited Industrial Dist. (I-1)
- Intensive Industrial Dist. (I-2)
- Waterfront Industrial Dist. (I-3)
- Industrial Mixed Use Dist. (IMX-1)
- AG Dist.- General (AG-2)
- Country Dist. (C)
- AG Dist.- Restricted (AG-1)
- Federal/Military Preserve Dist. (F-1)
- Preservation Dist. - General (P-2)
- Preservation Dist. - Restricted (P-1)

N

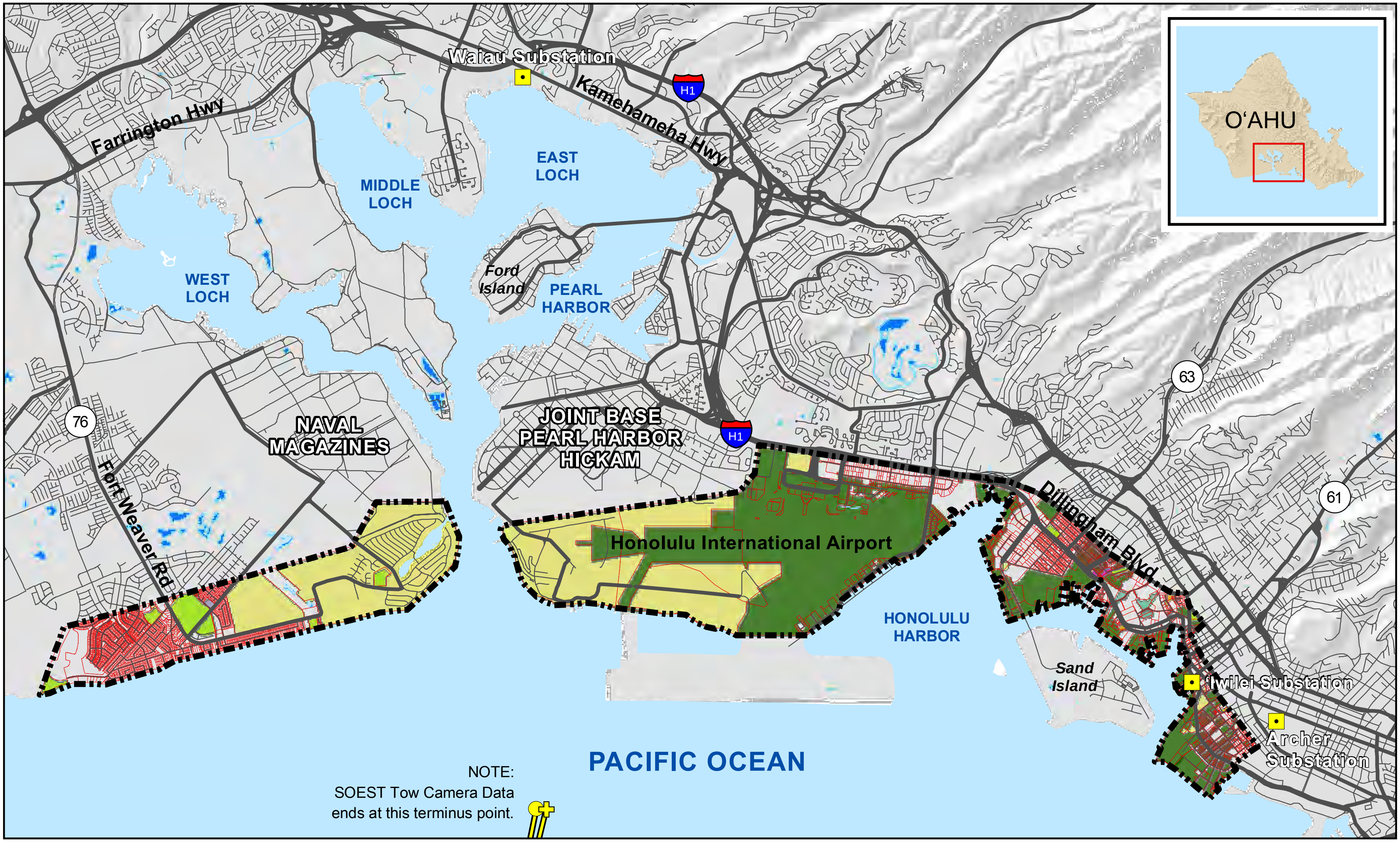
0 2,500 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

*** Special Apartment Mixed Use Districts are associated with special districts above or other designated areas.
**** Special zoned areas include Aloha Tower, Waikīkī and Kaka‘ako Improvement Districts, and other specially designated areas.

Date: 4/26/2012
Data Sources: HI-DBEDT, CCH, UH-SOEST, AECOM, 2012

Figure 3.5-20



Pearl Harbor Landing Site Area: Major Landowners and Private Parcels ***

Route with camera data *
Route without camera data **
Identified O'ahu Substation Locations
Highways & Major Roads
Other Roads

SOEST Cable Routes
HIREP Study Analysis Area
Freshwater Lake or Pond
Open Water
O'ahu TMK Parcels (2011)

Major Landowners (2011)
U.S. Government
State of Hawai'i
State Dept. of Hawaiian Homelands (DHHL)
City & County of Honolulu
Hawaiian Electric Company
Kamehameha Schools
The Queen Emma Foundation
Roman Catholic Church
Castle & Cooke
Alexander & Baldwin
Kualoa Ranch

N
0 5,000 Feet

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.
*** Major landowners and parcels have been clipped to the HIREP study area and may not represent the full parcel boundary.

Date: 4/28/2012
Data Sources: HI-DBEDT, NOAA, CCH, UH-SOEST, AECOM, 2012

Figure 3.5-21

3.6 MARINE TRANSPORTATION

3.6.1 Resource Definition

Marine transportation and commerce involves watercraft carrying people (passengers) or goods (cargo). Ship transport can be over any distance by boat, ship, sailboat, or barge; over oceans and lakes; through canals; or along rivers. Marine transportation may be for commerce, recreation, or the military. As a remote island state, Hawai‘i is uniquely dependent on marine transportation, ocean recreation, and commerce for its economic, environmental, and cultural health. Hawai‘i has 1,052 miles of ocean coastline and a population of 1,159,600.

Commercial fishing can be defined as the taking of fish and other seafood and resources from oceans, rivers, and lakes for the purpose of marketing them. Commercial fishing, impacts, and recommended CCMs are discussed in detail in Section 3.13 of this document.

State Harbor and Marina System

The Hawai‘i maritime port system consists of 10 commercial harbors on six major islands. These facilities include:

- Kauai District – Nawiliwili Harbor, and Port Allen Harbor
- O‘ahu District – Honolulu Harbor and Kalaeloa Barbers Point Harbor
- Maui District – Kahului Harbor, Kaunakakai Harbor, Kaumalapau Harbor, and Hana Harbor
- Hawai‘i District – Hilo Harbor, and Kawaihae Harbor

One of the main objectives of the statewide harbors program is to provide adequate maritime facilities to accommodate the needs of the commercial shipping industry and the public. Today, Hawai‘i is a key transportation and communications center with an important role as the link to the Pacific Rim economies. Hawai‘i’s geographical isolation mandates that nearly all imported goods arrive via island ports. Honolulu Harbor serves as the hub for the Hawai‘i port system from where interisland cargo distribution branches out to serve the neighbor islands.

Hawai‘i’s Foreign Trade Zone No. 9 facility is located at Pier 2 in Honolulu Harbor. Firms that use this facility enjoy the special legal status of being outside of the Customs territory of the U.S. This facility is open to any business that imports or exports merchandise through the Hawai‘i port system (HDOT 2012).

Commercial Shipping and Passenger Cruise Lines

Two of the largest U.S. flag commercial shippers in the state (Matson and Horizon) provide the bulk of interisland cargo shipments while also providing cargo shipping between Hawai‘i and other destinations. Larger international and mainland shipping routes terminate at ports such as Oakland, Los Angeles/Long Beach, Puget Sound, San Diego, Portland, and Guam, as well as ports in China. In addition to Matson and Horizon, Honolulu Harbor is served by other U.S. flag and international shipping companies. Hawaiʻi ports account for approximately 16.9 million short tons of cargo annually with over 8 million short tons handled through Honolulu Harbor. Of the 16.9 million short tons, 2.3 tons are of foreign origin. The private sector provides shipping services, stevedoring, warehousing, tug services, maintenance, ship chandlery and repair, distribution and other functions in support of harbor business. Interisland cargo shipping primarily involves the transshipment of goods arriving at the large container facilities at Honolulu Harbor being dispersed to smaller noncontainerized ports of the neighbor islands (HDOT 2012).

Bulk liquid fuel for the state is primarily shipped to Kalaeloa Barbers Point Harbor via tanker from Asia and from facilities on the mainland. This harbor is located on the west side of the island of Oʻahu and is the second busiest port in the state after Honolulu Harbor. More than half of the state's international trade focuses on petroleum products (HDOT 2012)

Numerous passenger cruise lines serve the main Hawaiian Islands. Within the landing site areas, Honolulu Harbor and Kahului Harbor serve as cruise ship terminals for both interisland and international cruises. In Honolulu, cruise ships berth at Pier 11 and at the newer cruise ship terminal at Pier 2. A 2012 schedule of passenger and cruise vessels for the Port of Honolulu shows 36 commercial cruise vessels making a total of 82 port calls in addition to the weekly *Pride of America* interisland cruises (52 a year). The Port of Kahului 2012 schedule shows six calls from passenger cruise ships in addition to the weekly *Pride of America* interisland cruises (52 a year) (HDOT 2012)

Ocean Transit and Communication Corridors

While the Superferry operated daily vehicle/personal high-speed hydrofoil ferry service between Oʻahu and Maui starting in 2007, that service has been suspended. The only regularly scheduled interisland passenger ferry service in the state is between the towns of Lahaina on the island of Maui and Manele Bay on the island of Lānaʻi, and between Lahaina and Kaunakakai, Molokaʻi.

Hawaiian waters are traversed by numerous interisland and trans-Pacific Ocean fiber-optic and telecommunications undersea cables. While some undersea cables serve interisland needs, most provide service and communications connections to North America and Asia. These cables are concentrated offshore of Oʻahu primarily at Kaena Point on the northwest corner and at Mokapuu Point on the southeast corner of the island. See Section 3.11 of this document for graphics showing the location of undersea cables and a description of existing undersea cable infrastructure.

Military Uses

U.S. Coast Guard

USCG is one of the five armed forces of the U.S. and the only military organization within the Department of Homeland Security. Since 1790, the Coast Guard has safeguarded U.S. maritime interests and environment around the world. USCG is the military force providing a presence along American rivers, ports, littoral regions, and on the high seas and protects America's coastlines and waterways. Hawai‘i is part of the USCG Fourteenth District (USCG 2012).

U.S. Navy

JBPHH consists of an amalgamation of the former Naval Station Pearl Harbor and Hickam Air Force Base, as well as the Pearl Harbor Naval Shipyard. The primary mission of Pearl Harbor is to provide berthing and shoreside support to surface ships and submarines, as well as maintenance and training. The station is among the largest bases in the world. Over 2.5 million passengers go through it every year, as well as 200,000 vehicles on over 65,000 boat runs. DoD will need to be consulted to determine if there are any classified transit corridors, submarine routes, undersea cables, or operations of defense-related facilities that may be impacted by placement of an undersea cable in the proposed undersea cable corridors (JBPHH 2012)

3.6.2 Regulatory Setting

The oceans around Hawai‘i are subject to a multitude of agency oversight from federal, state, and in some instances, county jurisdiction. These jurisdictional interests govern marine; military/national security; recreation; environmental resource preservation; and commerce, trade, and marine business interests. None of the marine surveyed areas are located in international waters. However, international vessels frequently traverse waters of the U.S. surrounding Hawai‘i for cargo delivery and commerce with the state or for crossing the area while traveling between other destinations. The International Regulations for Preventing Collisions at Sea (known as the International Navigational Rules or 72 COLREGS) were adopted as a Convention of the International Maritime Organization, which was entered into force in 1977. It provides in detail the requirements for navigation lights, day shapes, steering and sailing rules, and sound signals and provides a process to establish maritime routing systems that require vessels to travel in specific locations and directions when transiting through congested regions or other areas in which routing schemes are determined to be desirable or necessary. Federal regulations concerning marine navigation are codified in Title 33 C.F.R. Parts 1 through 300 and are implemented by USCG and USACE. Federal regulations for marine vessel shipping are codified in Title 46 C.F.R. Parts 1 through 599 and are implemented by USCG, Maritime Administration, and the Federal Maritime Commission.

Other applicable federal navigation rules include the Cable Act of 1992 (Title 47 C.F.R. Part 76), which states that other vessels must maintain a 1.15-mile (1-nautical mile [nm]) separation from a vessel laying or repairing an undersea cable. Statutory navigation rules define the responsibilities of vessels restricted in their ability to maneuver, such as cable-laying vessels, and of other vessels operating in their vicinity, all aimed at preventing collisions or other incidents (MBNMS 2005).

Commercial Harbors Plans

Currently, each major island has developed a Commercial Harbors Master Plan, which guides the long-term development of each major island's commercial ports.

The Oʻahu Commercial Harbors 2020 Master Plan was completed in 1997. Objectives of this plan are:

- To plan the necessary port and harbor facilities to meet the future operational requirements of Oʻahu's commercial harbor users. Facilities will be planned to preserve or enhance current harbor capacity and to ensure a high level of safety, a reliable security system, and preservation of the environment.
- To promote Hawaiʻi's economy through a focus on facilities for cargo, tourism, and commercial fishing operations in a manner that best relates to and serves the commerce of the state.
- To optimize the maritime commercial utilization of port and adjacent resources in creating an efficient, productive, accessible, and "user-friendly" harbor environment.
- To actively pursue solutions to commercial harbor problems through the identification, acquisition, and development of additional harbors facilities, including but not limited to Keehi Lagoon, Pearl Harbor, and Kāneʻohe Bay.

The Kahului Commercial Harbor 2030 Master Plan EIS was completed in 2007. Objectives of this plan include:

- Meet current and anticipated demand for cargo coming into and out of the port.
- Take steps to decrease congestion in the port in the near future.
- Make space for an interisland ferry and a cruise ship berth.
- Continue to respect recreational uses in the Kahului Commercial Harbor area.

Harbors Modernization Plan

In 2007, the State formulated a harbors modernization plan (HDOT 2007b) to ensure the long-term functional, physical, and fiscal viability of the commercial harbors in Hawaiʻi. The plan outlines challenges and landing site areas for commercial harbors in Hawaiʻi and has application to two of the landing site areas in this document—Pearl Harbor and Kahului Harbor. These challenges and projections included:

- Population, visitor, and business growth in the previous 15 years significantly increased the demand for importation of cargo.
- Cargo container volume was expected to increase as much as 27 percent by 2010; 66 percent by 2015, and 93 percent by 2020.
- Harbor-user operations have been hampered by a lack of adequate space.
- Interisland barge departures from Honolulu Harbor increased 22 percent in the prior 3 years and 33 percent since 2001.
- Hawai‘i’s cruise industry had grown tremendously, with both a home-ported cruise line and increased port-of-calls by foreign cruise ships.

Maui County

Maui only has one commercial harbor, which is the third-busiest harbor in the state and the busiest neighbor island commercial harbor. Maui’s population had grown 32 percent in the 15 years prior to 2007 and the increased demand for goods exceeds the existing three-pier facility in Kahului Harbor. The *2030 Master Plan Kahului Harbor* (HDOT 2007b) includes the following projects:

- A new west harbor breakwater;
- A new west harbor ferry/barge slip with terminal building including paving, utilities, and fencing;
- A new west harbor cruise terminal;
- A new east harbor breakwater;
- Upgrading of Pier 1 fuel line;
- Acquisition of additional property to expand the east end of Kahului Harbor;
- Strengthening of Pier 2B; and
- Other necessary paving and fencing improvements.

Island of O‘ahu

Honolulu Harbor is the hub of the state commercial harbor system. The plan includes the development of the former Kapalama Military Reservation (KMR) and improvements at the Kalaeloa Barbers Point Harbor. The O‘ahu plan (HDOT 2012) includes the following projects:

- Construction of a KMR container deep-draft wharf with berthing capacity to accommodate two container ships;
- Development of a new 70-acre container yard at Kapalama with necessary gates, buildings, and off-site improvements with direct connection to the Young Brothers interisland barge operating yard;
- Construction of Kalaeloa west harbor utilities infrastructure; and
- A new dedicated fuel pier at Kalaeloa.

Commerce and Cargo

Hawaiʻi Department of Transportation– Harbors

The Harbors Division is tasked with planning, designing, constructing, operating, and maintaining state facilities in all modes of water transportation. Coordination with other state, county, and federal programs is maintained in order to achieve the objectives under provisions of HAR Title 19, Chapters 41–44 and HRS Chapter 266.

Hawaiʻi Department of Land and Natural Resources

Since 1993, the DLNR Division of Boating and Ocean Recreation (DOBOR) has been responsible for managing and administering the ocean-based recreation and coastal areas programs pertaining to the ocean waters and navigable streams of the state (excluding commercial harbors); planning, developing, operating, administering, and maintaining small boat harbors and other boating facilities; and regulating the use of these facilities. DLNR, under its Office of Conservation and Coastal Lands (OCCL), also administers Hawaiʻi's Conservation District Use Application (CDUA) permit process, which is triggered by any proposed marina construction project because submerged lands are included within the State Conservation District.

Merchant Marine

Almost every nation has a merchant marine, a fleet of ships that are usually owned and registered in that nation and fly under its flag, but are separate from the military. The merchant marine carries goods and people, and is a vital part of the national economy. Depending on the country, some merchant marines may have military training as well as nautical training. The Merchant Marine is a civilian auxiliary of the U.S. Navy, except during times of war when mariners are considered military personnel (Encyclopedia.com 2003).

Federal Maritime Commission

The Federal Maritime Commission (FMC) regulates ports and marine terminal operators engaged in U.S. oceanborne commerce and receives and reviews tariff filings. The FMC is the independent federal agency responsible for regulating the U.S. international ocean transportation system for the benefit of U.S. exporters, importers, and the U.S. consumer.

International Waters and Treaties

The United Nations (UN) Convention on the High Seas of 1958 outlines agreements and a regulatory framework for nations' interaction and activities in international waters or "high seas," including the laying of cables in the high seas. High seas are defined by the Convention as "all parts of the sea that are not included in the territorial seas or in the internal waters of the state." Neither the current landing site areas nor the ocean waters connecting them fall within areas defined as "high seas" by the UN and are therefore not regulated under provisions of this Convention. All of the waters in the landing site areas and surrounding oceans connecting the islands are either contained in state waters up to 3 nm from shore or waters up to 200 nm from shore which are defined as territorial waters (Exclusive Economic Zone [EEZ]) of the U.S.

Military and Security

U.S. Coast Guard

In the maritime realm, the duty of the U.S. government to safeguard the lives and safety of its citizens falls to USCG. In partnership with other federal agencies; state, local, and tribal governments; marine industries; and individual mariners, USCG improves safety at sea through complementary programs of mishap prevention, search and rescue, and accident investigation. USCG prevention activities include the development of standards and regulations, various types of plan review and compliance inspections, and a variety of safety programs designed to protect mariners. To ensure compliance, USCG reviews and approves plans for ship construction, repair, and alteration. USCG also inspects vessels, mobile offshore drilling units, and marine facilities for safety. USCG is tasked with 11 missions (USCG 2012):

- Ports, waterways, and coastal security
- Drug interdiction
- Aids to navigation
- Search and rescue
- Living marine resources
- Marine safety
- Defense readiness
- Migrant interdiction
- Marine environmental protection

- Ice operations
- Other law enforcement

Navy

While the Navy will not be specifically regulating or permitting the marine aspects of a future proposed undersea cable project, coordination with the Navy would be needed to ensure that defense facilities, movements, or security procedures are not impacted or compromised by the construction or operation of the undersea cable facilities. Consultation and possible approvals from the Navy will likely be required where cable landing site areas are located on or near federal defense facilities on O‘ahu.

U.S. Army Corps of Engineers – Pacific Ocean Division

The Pacific Ocean Division (POD) provides the local support for the USACE mission. Honolulu District offers project management, design, construction management, contracting, cost engineering, and more in support of military services and other federal, state, and local government agencies in Hawai‘i and other island nations in the Pacific Ocean. These services can include engineering projects in the ocean, near the shore, and at ports and harbors. This agency reviews and permits any project that may impact waters of the U.S. under provisions of its Section 404 and Section 10 permitting authority. USACE has the authority to protect the waters of the U.S., including wetlands, by regulating certain activities within those waters. Section 404 of the CWA requires that anyone interested in placing dredged or fill material into waters of the U.S. must first obtain a permit from USACE. Section 10 of the Harbors and Rivers Act of 1899 requires approval prior to undertaking of any work in or over navigable waters of the U.S., or which affects the course, location, condition, or capacity of such waters. This law applies to any dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of a navigable water of the U.S., and applies to all structures, from the smallest floating dock to the largest commercial undertaking USACE 2012).

Hawai‘i Department of Defense/Civil Defense

The Hawai‘i Department of Defense is the umbrella organization for the Hawai‘i Army National Guard, Hawai‘i Air National Guard, and State Civil Defense Agency. The mission of the State of Hawai‘i Department of Defense is to assist authorities in providing for the safety, welfare, and defense of the people of Hawai‘i. While not specifically engaged with facilitating or regulating marine commerce and transportation, this agency provides disaster warning information, training, disaster preparations and plans, and coordination for disaster response both on land and in the territorial waters of the state, all which affect movement of goods in and around the state.

Environmental – Habitat

Marine species, habitat, the marine environment, and the preservation of marine natural resources are discussed in Section 3.7 of this document.

3.6.3 Region of Influence

The ROI consists of the proposed undersea cable corridors, which for study purposes will consist of a proposed undersea cable corridor width of 200 feet where these corridors extend through state jurisdictional waters and into federal jurisdictional waters, eventually connecting at various landing site areas as described in this document. The ROI will specifically focus on where these potential cable corridors intersect shipping routes, interfere with harbor operations, or impact marine military facilities.

3.6.4 Affected Environment

General

As an island state, there are crucial transportation corridors providing food, fuel, building materials, and consumer products to the various islands that make up the state. Transportation of cargo between islands and between Hawai‘i and other destinations must remain uninterrupted and clear. The harbors and facilities involved in the landing site areas must also remain functioning during any construction, operational, or decommissioning phase of an undersea cable. Table 3.6-1 compares harbor volume share and growth between the largest ports in the landing site area in comparison to the rest of the state.

Maui County – O‘ahu Routing Specific

Maui

Maui-Kahului Harbor

As the primary port of entry for goods on Maui, transportation at the Kahului Harbor complex provides a vital link for residents, business, and government of Maui County. The harbor is a man-made port, dredged from naturally-occurring Kahului Bay. Currently, the harbor basin is 2,050 feet wide by 2,400 feet long and has a project depth of 35 feet, and is protected by two large breakwaters with an opening to the north. The entrance channel between the breakwaters is 660 feet wide and 40 feet deep (HDOT 2007b).

The harbor consists of two distinct operational areas; the east side serves as the main commercial operational area, while the west side’s importance for commercial use is only as a breakwater, helping to protect the harbor from swells. Commercial operations are currently limited to approximately 50 acres on the east side of the harbor where there are three major berthing facilities (Piers 1, 2, and 3) with storage areas, warehouses, harbor offices, and tenant buildings. In general, overseas containers (i.e., containers that originate from outside Hawaiʻi) are handled at Pier 1 and interisland containers are handled at Pier 2. At one time, the harbor hosted Superferry interisland passenger and vehicle operations within the already congested harbor. The Superferry suspended operations in the state in 2009.

Other facilities in the harbor include the administration area (2.1 acres), an auto storage yard (3.9 acres), privately owned vehicle (POV) parking (0.4 acre), and other unspecified areas (0.6 acre). Supporting facilities at the port, adjacent to facilities owned by HDOT-Harbors Division, include storage tanks for fuel, cement, and molasses, as well as sugar processing and storage warehouses. Currently, Pier 1 is used as a cruise ship terminal accommodating weekly dockings of the interisland cruise of the *Pride of America* cruise ship as well as accommodating some cruise ships visiting from outside Hawaiʻi (HDOT 2007b).

Table 3.6-2 shows cargo and passenger throughput at Kahului Harbor for fiscal year 2005.

Maui–Kapalua

The Kapalua landing site area is not part of Hawaiʻi's harbor and marina system. This landing site area does not receive cargo or shipments but does host some offshore recreation mooring sites and other private marine recreational uses. The Lānaʻi-Lahaina ferry travels to the south of Kapalua and does not traverse near this landing site area. Interisland cargo shipments from Honolulu Harbor travel along the north side of the island of Maui to Kahului or Hana Harbors and not near the Kapalua area.

Lānaʻi

There are no State of Hawaiʻi harbors or ports in the Lānaʻi landing site area. Undersea cables extending from the islands of Molokaʻi and Oʻahu to the north would need to traverse the Kalohi Channel. This channel is the main route servicing marine transportation between Oʻahu and the various islands of Maui County.

Molokaʻi

Molokaʻi–Kaluakoi

There are no State of Hawaiʻi harbor facilities in this landing site area. An undersea cable constructed from Oʻahu to this area would need to traverse the Kaiwi Channel, which separates Molokaʻi from Oʻahu by 38 miles. This channel is traversed by monthly barge deliveries to the Kalaupapa settlement on the north shore of Molokaʻi. Annually, the channel is traversed by various outrigger paddling and stand-up paddling competitions between the islands of Oʻahu and Molokaʻi.

Molokaʻi-Kaunakakai

The actual landing site area is situated west of Kaunakakai Harbor. The harbor is both a recreational and commercial harbor and is shared by DOBOR and HDOT – Harbors Division. This harbor is the main harbor for the island of Molokaʻi and receives regularly scheduled barge shipments from Honolulu Harbor. The harbor consists of one 12-foot-wide ramp, 29 berths/mooring spaces, two docks, pier vessel washdown, restrooms, and the harbor office. As with Lānaʻi, a shipping channel between the islands of Maui County and Oʻahu is located in the Kahohi offshore from Kaunakakai Harbor (HDOT 2007b).

<u>Oʻahu</u>

MCBH at Kāneʻohe Bay

While the MCBH at Kāneʻohe Bay landing site area does not contain any State of Hawaiʻi harbor facilities, the landing site area sits partially within a military base. Since both state harbors on Oʻahu are located on the south shore of the island, the area around this landing site area does not encompass a commercial marine transportation corridor but may contain military operational, transportation or training corridors offshore of the base.

Pearl Harbor

This landing site area sits at the center of the busiest shipping, passenger cruise ship terminal area, and cargo corridor in the state and encompasses the state's most critical and busy commercial port at Honolulu Harbor and the Pacific's most strategic and important military facility at JBPHH.

Honolulu Harbor consists of commercial shipping in bulk, individual units, or containers (Wil Chee Planning, Inc. 1999). The major categories of cargo passing through Honolulu Harbor are:

- Automobiles – in containers or "roll on-roll off"
- Overseas containers (domestic and foreign)
- Neobulk – large unitized loads
- Breakbulk/general cargo – any type of "small lot" commodity
- Dry bulk – dry commodities shipped in bulk
- Liquid bulk – any type of liquid including fuel
- Interisland cargo – commodities originating and shipped within the state

The harbor also contains facilities for cruise ships, excursion vessels, and commercial fishing operations located within 53 piers. The existing main entrance channel to the harbor (Fort Armstrong Channel) is 4,000 feet long, 500 feet wide, and 45 feet deep while the main harbor basin is 3,300 feet long, 1,520 feet wide, and 40 feet deep. The harbor also contains a smaller west harbor basin and the 400-foot-wide, 23-foot-deep Kalihi Channel (HDOT 2007b).

As of 2007, Honolulu Harbor handled 11 million tons of cargo annually. The number of mainline vessel 20-foot equivalent units (TEUs) handled per terminal acre annually in 2005 was over 7,000. Because of space constraints, the harbor's port density is higher than any other west coast port. The addition of Aloha Tower Marketplace in 1994 made Honolulu Harbor unique by including visitor attractions, retail, and restaurant activities within a working commercial harbor (HDOT 2007b).

In addition to the facilities at Honolulu Harbor, the landing site area contains a small man-made boat harbor at Kewalo Basin in the Kakaako area, public and private small boat marinas at Keehi Lagoon, numerous harbor support uses, recreational paddling landings, and both state and county beach park facilities along the shore. The state's second busiest harbor, including the prime petroleum delivery and storage area, is located just to the west of the landing site area at Kalaeloa Harbor and the Campbell Industrial complex (HDOT 2007b).

3.6.5 Potential Impacts of Cable System Implementation

General Description of Impact Types

The placement of undersea cables between islands could possibly disrupt any of the above operations or facilities. Possible impacts to the environment and resources are discussed in Section 3.7 while possible disruptions and impacts to marine recreational uses are discussed in Section 3.12 of this document. The placement of the cable during the construction phase would likely have the greatest potential impact to disrupting commerce, safety operations, military movements, and marine transportation. Construction impacts would be temporary in nature. The primary impacts during construction may include:

- Volume of dredge material to achieve appropriate cable depth
- Impact of cable-laying vessel on navigation

The placement/construction of the cable and eventual operations will need to be designed so that it does not disrupt ocean commerce, transportation, and recreation nor compromise military security and missions in the area. During the operations and maintenance phases, the following areas could be affected by program implementation:

- Security impacts if maintenance personnel need to access a secured port operations area;

- Comparison of various parcels of land around harbors in terms of relative value for cargo operations, and opportunity cost to give up space for electrical infrastructure in lieu of traditional commercial harbor operations; and
- Ability to expand high-value marine assets (wharves in particular) that may be affected with addition of new long-term constraints in terms of marine cable routes or position of landside infrastructure.

Maui County – Oʻahu Routing Specific

<u>Maui</u>

Maui-Kahului Harbor

Construction and operation of a cable will need to avoid impacts to marine transportation corridors in both the Kalohi and Pailolo Channels that separate the main islands of Maui County. As the main port of entry for goods and cargo, impacts to Kahului Harbor will need to be minimized so that movement of goods through the port is not compromised. Ferry operations between Lahaina and Molokaʻi may be impacted if a cable is placed across the ferry route through the Kalohi Channel.

Maui-Kapalua

There is no commercial port or cargo operations at the Maui-Kapalua landing site area. If an undersea cable is proposed linking the island of Maui to Molokaʻi, impacts to the marine transportation routes through the Kalohi and Pailolo Channels will need to be analyzed. The marine surveyed areas shown in the landing site area (Figure 2-2) would not impact the ferry operations between Lahaina and Lānaʻi but may impact ferry operations between Lahaina and Kaunakakai on the island of Molokaʻi.

<u>Lānaʻi</u>

The landing site area does not contain a port or harbor. The Lānaʻi ferry operates out of Manele Bay on the south side of the island. A cable extending from the Lānaʻi landing site area to Molokaʻi will need to cross the Kalohi Channel, which serves as a primary marine transportation route between the islands of Maui County and Honolulu Harbor.

<u>Molokaʻi</u>

Molokaʻi-Kaluakoi

This landing site area does not contain a commercial port or harbor. A cable between this landing site and Honolulu Harbor will need to cross the Kaiwi Channel parallel and within a marine transportation corridor. The Kaiwi Channel serves commerce as well as recreational uses such as outrigger paddling and other competitive sporting events between Molokaʻi and Oʻahu. Impacts to these events during placement of the cable would need to be analyzed.

Molokaʻi–Kaunakakai

Three possible cable corridor routes are being considered at this location. All three corridors would need to cross marine transportation corridors serving all of the site study area. The southern cable corridor to Lānaʻi would need to cross the Kalohi Channel, the eastern route to Maui would need to cross the Pailolo Channel, and the western route to Oʻahu would need to cross the Kaiwi Channel. All of these channels serve interisland marine traffic and some recreational uses between islands. The eastern corridor would need to cross the route of the interisland passenger ferry between Kaunakakai Harbor on Molokaʻi and Lahaina on Maui.

Oʻahu

Oʻahu-MCBH at Kāneʻohe Bay

This landing site area location contains a military use harbor at MCBH at Kāneʻohe Bay but does not contain any commercial ports or harbors. All of Oʻahu's commercial ports are located on the south side of the island. A cable constructed between this location and the Kaluakoi landing site location on the island of Molokaʻi would need to cross the Kaiwi Channel, which at this location, serves as an interisland route for limited barge deliveries to the Kalaupapa settlement on the north side of Molokaʻi. Development of a cable in this corridor would not impact any other interisland marine transportation routes.

Oʻahu-Pearl Harbor

Placement of a cable in this landing site area could impact utility, recreational, interisland, military, international, and mainland U.S. shipping corridors, operations, and emergency functions. The possible impacts or limitations of placing and operating an undersea cable at or near the large JBPHH military complex and the large port and passenger facilities at Honolulu Harbor would need to be analyzed.

3.6.6 General Siting Criteria and Special Conservation and Construction Measures

The following CCMs would be applied generally to cable routes that cross open sea and marine transportation routes. These CCMs would also apply to cable maintenance, replacement, and/or decommissioning.

MT-1 During the cable-laying, maintenance, replacement, and/or decommissioning process, all vessels in the area must comply with provisions of the Cable Act of 1992

(Title 47 C.F.R. Part 76), which states that other vessels must maintain a 1.15-mile (1-nm) separation from the vessel laying the cable or repairing an undersea cable.

MT-2 A vessel engaged in laying an undersea cable is defined by USCG as a "vessel restricted in her ability to maneuver." All vessel cable-laying work shall be in compliance with the Navigation Rules established through the International Navigational Rules Act of 1977 (P.L. 95–75, 91 Stat. 308, or Title 33 U.S.C. Sections 1601–1608).

MT-3 A week prior to commencement of the undersea cable-laying process, the project manager shall publish notice and schedule of any proposed undersea cable laying in the USCG District 14 *Local Notice to Mariners (LNM)*. The project manager shall develop this notice from information received from USCG, U.S. Merchant Fleet, NOAA, National Ocean Service, and other sources.

MT-4 Request issuance of a *Broadcast Notice to Mariners (BNM)* from USCG District 14 no less than 48 hours prior to commencement of the undersea cable-laying process

MT-5 Mark all temporary waterway obstructions with flashing yellow lights for the protection of navigation.

MT-6 Equip all vessels with radar reflectors.

The following CCMs are applicable to cable routes that would terminate at or near one or more landing site areas that contain a state harbor. These CCMs would also apply to cable maintenance, replacement, and/or decommissioning. Currently, two landing site areas contain state harbors: Pearl-Honolulu Harbor and Kahului Harbor.

MT-7 Provide notice to the appropriate harbormaster 30 days prior to commencement of the undersea cable-laying process.

MT-8 A week prior to commencement of the undersea cable-laying process, the project manager shall publish notice and schedule of any proposed undersea cable laying in the USCG District 14 LNM. The manager shall develop this notice from information received from USCG, U.S. Merchant Fleet, NOAA, National Ocean Service, and other sources.

MT-9 Request issuance of a BNM from USCG District 14 no less than 48 hours prior to commencement of the undersea cable-laying process.

The following CCMs are applicable to cable routes that would terminate at or near one or more landing site study locations that contain military bases. These CCMs would also apply to cable maintenance, replacement and/or decommissioning. Currently, two landing site locations contain military bases: Pearl-Honolulu Harbor and MCBH at Kāneʻohe Bay.

MT-10 Prior to the selection and scheduling of any cable routing and laying, coordinate with the appropriate DoD branch to avoid impacting military undersea, shore or land operations, functions, transportation routes, or exercises (classified or unclassified).

MT-11 Secure all approvals from the appropriate base military commander 30 days prior to commencement of the undersea cable-laying process.

MT-12 A week prior to commencement of the undersea cable-laying process, the manager shall publish notice and schedule of any proposed undersea cable laying in the USCG District 14 LNM. The project manager shall develop this notice from information received from USCG, U.S. Merchant Fleet, NOAA, National Ocean Service, and other sources.

MT-13 Request issuance of a BNM from USCG District 14 no less than 48 hours prior to commencement of the undersea cable-laying process.

Table 3.6-1. Harbor Volume Share and Growth between Honolulu and Kahului Harbors

Harbor	TEUs (2004)	Share %[1]	Total Growth (1995–2004)
Honolulu	1,222,196	79.2	56.8%
Kahului	117,101	7.6	91.7%

[1] as percentage of total volume in state
TEU = 20-foot equivalent unit

Table 3.6-2. Cargo and Passenger Throughput at Kahului Harbor for Fiscal Year 2005

Category	Units	Import	Export	Total
Containers	TEU	71,360	55,240	126,600
Vehicles	tons	96,645	60,314	159,959
Break-Bulk	tons	215,290	72,771	288,061
Dry-Bulk	tons	132,562	573,935	706,497
Liquid-Bulk	tons	855,647	72,381	926,932
Cruise Passengers	each			147,450

Source: HDOT 2007b

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3.7 MARINE BIOLOGICAL RESOURCES

3.7.1 Resource Definition

The marine benthic and offshore resources considered in this section include the seafloor and water column that are associated with the ROW for the marine cable that would carry electrical power from the alternative energy sources to the receiving substations. The offshore environment includes water depths to about 700 m, which are effectively considered deep-sea habitats. The sediments, other geological features, benthic organisms, and demersal fish along this route would be disturbed during the construction process. Many of the seafloor organisms are likely rare or even new to science. The surrounding water column provides habitat for numerous species of fish, marine mammals, and turtles, some of which are threatened or endangered species that might also be disturbed during the construction process, either directly from noise or indirectly from associated sediment plumes. Postconstruction impacts arising from electromagnetic fields (EMFs) generated by the electrical transmission is another possible source of concern.

Offshore Seafloor Habitats (SOEST Data)

The University of Hawaiʻi's School of Ocean and Earth Sciences and Technology (SOEST) conducted a number of studies to assess and recommend route options for undersea transmission cables between the islands of Molokaʻi, Lānaʻi, Maui, and Oʻahu. Because the cable was to be buried along much of the route, it was necessary to collect sufficient data to assess potential hazards and the types of seafloor habitats and organisms encountered. The main efforts were focused on (1) a southern route from Pearl Harbor and Mammala Bay, Oʻahu, to northwest Molokaʻi, and (2) a northern route from Kāneʻohe, Oʻahu, to northwest Molokaʻi. Other routes forming interconnects and landing site areas from Molokaʻi to the other islands were also examined. The seafloor off Mammala Bay proved to be littered with potential unexploded ordnance (UXO) and other items of World War II vintage. After side scan sonar surveys, these sites were extensively surveyed with manned submersibles and remotely operated vehicles (ROVs). The most significant items encountered were small finned bombs that are believed to be chemical ordnance. Due to these hazards, SOEST was not able to recommend a safe passage for the cable along the southern connection from Pearl Harbor to Molokaʻi (Taylor 2009, 2010 a–b).

The northern route did not contain the same hazards but was believed to have several areas of potentially sensitive habitats associated with hard-substrate reef terraces. Given the importance of deep-water corals and similar sensitive habitats identified by BOEM, these areas needed to be identified and documented as carefully as possible. Similar efforts were applied to other routes suggested between the other islands (SOEST 2010).

As part of the present document, AECOM reviewed the SOEST data and further assessed the habitats along the routes that have been suggested and mapped.

Offshore Benthic Biota (SOEST Data)

The marine benthic organisms documented as part of the SOEST surveys were those observed with video images collected with either a towed camera sled (TowCam or TC) or ROV. The organisms observed in this manner are typically megafauna, or organisms that pass through relatively large sieves of 2-mm mesh or greater. These include sea pens, sea fans (gorgonians), burrowing anemones, anemones attached to seafloor objects, sea urchins, holothurians, crinoids, shrimp, and crabs. The smaller and more abundant macrofauna (>0.3 mm and <2 mm) and meiofauna (>0.063 mm and <3 mm) were not sampled. Some demersal fish were also observed on the video, but no reports of trawling or other studies were conducted to more adequately assess demersal fish populations.

Open Water Endangered and Threatened Species (NOAA and State Resources)

The NOAA has jurisdiction over listed threatened and endangered species. The Endangered Species Act of 1973 (ESA) provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range and the conservation of the ecosystems on which they depend. NOAA's National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibility for implementing the ESA. Generally, USFWS manages land and freshwater species, while NMFS manages marine and anadromous species. Under Section 7 of the ESA, all federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated critical habitat.

When a species is listed as endangered, ESA Section 9 take prohibitions are automatically extended to it. When a species is listed as threatened, protective regulations are issued under Section 4(d) of the ESA in order to extend any take prohibitions to that species.

The ESA also requires NMFS to designate critical habitat and to develop and implement recovery plans for threatened and endangered species. Critical habitat is defined as specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Section 6 of the ESA provides a mechanism for cooperation between NMFS and individual states in the conservation of threatened, endangered, and candidate species. Under Section 6, NMFS is authorized to enter into agreements with any state that establishes and maintains an "adequate and active" program for the conservation of endangered and threatened species. Once a state enters into such an agreement, NMFS is authorized to assist in, and provide federal funding for, implementation of the state's conservation program. NMFS entered into a cooperative agreement with the State of Hawai‘i DLNR on August 29, 2006, for the management of two marine mammals and two sea turtles (Hawaiian monk seal, hawksbill sea turtle, humpback whale, and green sea turtle).

3.7.2 Regulatory Setting

General Overview

Bureau of Ocean Energy Management

On October 1, 2011, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) was replaced by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) as part of a major reorganization. This agency was also formerly known as the Minerals Management Service (MMS).

BOEM manages the exploration and development of the nation's offshore resources. It seeks to appropriately balance economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development, and environmental reviews and studies. BOEM and the Department of Energy (DOE) signed a Memorandum of Understanding (MOU) to address numerous offshore renewable energy issues of mutual interest. DOI and DOE issued the first interagency plan on offshore wind energy (MMS 2007), demonstrating a strong federal commitment to expeditiously develop a sustainable, world-class offshore wind industry in a way that reduces conflict with other ocean uses and protects resources. BOEM is also working with other interested federal agencies to establish MOUs to coordinate renewable energy activities on the outer continental shelf (OCS).

In addition to issuing leases, BOEM also has the authority to issue ROW grants for the offshore transmission lines that link OCS installations to facilitate efficient interconnection to the onshore electrical grid. For example, BOEM received an ROW request for a proposed transmission line running from Virginia to New York on the OCS; they issued a public notice asking whether there is competitive interest in constructing renewable energy transmission facilities in the proposed area and soliciting comments on the potential environmental consequences. The bureau expects similar ROW requests for offshore Hawai‘i in the near future.

NOAA

NOAA's NMFS is the principal federal agency responsible for conserving, protecting, and enhancing marine wildlife and their habitats. The Pacific Islands Region (PIR), established in April 2003, has the largest area of jurisdiction of any NOAA fisheries region and includes waters throughout the central and western Pacific Ocean, including the main Hawaiian Islands, Northwest Hawaiian Islands, Guam, American Samoa, and the Commonwealth of the Northern Marianas Islands. PIR’s Protected Resources Division (PRD) is dedicated to protecting and recovering endangered and threatened species of sea turtles, monk seals, and dolphins as mandated by the ESA and Marine Mammal Protection Act (MMPA). PRD attempts to mitigate the adverse effects of human activities through the development of appropriate regulations and management strategies. Main concerns include marine mammal and sea turtle injury and mortality as a result of commercial and noncommercial fishing, coastal development, military operations, and other ocean/beach usage.

DLNR is entrusted with the management of Hawaiʻi’s natural and cultural resources, including resources in the ocean and on the seafloor. DLNR is engaged in numerous efforts to maintain or improve the health of Hawaiʻi’s resources while gaining a better understanding of their complexity. Within DLNR, the Division of Aquatic Resources (DAR) and DOCARE are most active in managing Hawaiʻi’s marine protected resources. Other divisions that also assist in this area include the Division of Boating and Ocean Recreation (DBOR), the Division of Forestry and Wildlife (DOFW), the Land Division (LD), and the Division of State Parks (DSP).

DAR manages Hawaiʻi’s marine and freshwater resources through programs in commercial fisheries and resource enhancement; aquatic resources protection, enhancement and education; and recreational fisheries. Major program areas include projects to manage or enhance fisheries for long-term sustainability of the resources, to protect and restore the aquatic environment, to protect native and resident aquatic species and their habitat, and to provide facilities and opportunities for recreational fishing consistent with the interests of the state.

DOCARE is responsible for enforcement activities of DLNR. The division has full police powers and enforces all state laws and rules involving state lands, state parks, historical sites, forest reserves, aquatic life and wildlife areas, coastal zones, conservation districts, and state shores, as well as county ordinances involving county parks.

State of Hawaiʻi

The State of Hawaiʻi regulations concerning the cable routes within the 3-mile limit are detailed in Section 3.14.

3.7.3 Region of Influence

Interisland Routes

The marine surveyed areas as currently conceived would provide connections between the following landing site areas: (1) Oʻahu and Molokaʻi, (2) Molokaʻi and Lānaʻi, and (3) Molokaʻi and/or Lānaʻi and Maui. Most of the Oʻahu—Molokaʻi route is in federal waters managed by

BOEM and NOAA, whereas the other interisland routes shift between federal waters and State jurisdiction. Details of the State of Hawaiʻi jurisdiction can be found in Section 3.14.

Bathymetric Summary of Open Water Routes

Water depths range from shallow coastal waters to moderate deep-sea depths of >700 m in the interisland basins. The benthic habitats found in these deeper depths are poorly known and not well surveyed or sampled. The review of the SOEST video collected along proposed routes suggests that sensitive habitats containing deep-water corals may be present (see Section 3.7.4).

Marine Sanctuaries and Protected Areas in Federal waters

The Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) is one of 13 national marine sanctuaries created under the U.S. Marine Protection, Research and Sanctuaries Act (MPRSA) and administered by NOAA. Stretching from Maui to several nearby Hawaiian Islands, the boundary of the sanctuary encompasses approximately 1,218 square nautical miles of coastal and ocean waters. Throughout the main Hawaiian Islands, the sanctuary extends seaward from the shoreline to the 200 m isobath. It includes areas around the islands of Maui, Lānaʻi, and Molokaʻi, and parts of Oʻahu, Kauai, and the Hawaiʻi Island. All harbors are excluded from the boundaries.

Congress initially authorized the sanctuary in 1992, and it was formally approved in 1997. Established for the purpose of conservation, research, and education, the sanctuary develops programs and takes initiatives that strengthen resource protection measures and ensure the long-term recovery of humpback whales. The primary focus of such efforts lies in educating the public about existing regulations that protect humpback whales, enhancing the enforcement of these laws, and working cooperatively with other agencies, including NOAA Fisheries, to increase awareness of humpbacks and their habitat. The sanctuary's resource protection program complements existing federal and state regulatory mechanisms that protect humpback whales and their habitat. The purpose of this program is to develop and implement strategies that reduce human impacts within the sanctuary.

Approximately 65 percent of sanctuary waters fall under the jurisdiction of the State of Hawaiʻi; thus, the sanctuary works closely with state agencies to ensure the coordinated management of sanctuary resources and habitats. In addition, the sanctuary conducts regular consultations with the State of Hawaiʻi and other federal agencies to review all permit requests for activities that may affect humpback whale habitats.

3.7.4 Affected Environment

General Overview

ROV and TowCam coverage of surveyed areas suggested by SOEST associated with Oʻahu, Molokaʻi, Lānaʻi, and Maui are shown in Figure 3.7-1. While the majority of the surveyed seafloor is outside of 3 miles and under federal jurisdiction, the surveyed routes do partly extend into state waters, especially in and around the islands of Molokaʻi, Lānaʻi, and Maui.

State Jurisdiction (Links to Nearshore Studies)

Each of the selected proposed routes would link from a landing site area within State jurisdiction (shoreline to 3 miles offshore) to federal waters (beyond 3 miles) and back to the landing site area. Details of the State of Hawaiʻi jurisdiction can be found in Section 3.14.

Federal waters

BOEM jurisdiction

BOEM will issue the ROW for cable installation in federal waters except where NOAA has jurisdiction in designated Marine Sanctuaries. BOEM will most likely require details on the presence or absence of any critical sensitive habitats along any route that is intended for ROW authorization. BOEM can designate exclusion zones around sensitive habitats that might be identified.

NOAA jurisdiction

NOAA Fisheries is the principal federal agency responsible for conserving, protecting, and enhancing marine wildlife and their habitats. The PIR, established in April 2003, has the largest area of jurisdiction of any NOAA Fisheries region and includes waters throughout the central and western Pacific Ocean including the main Hawaiian Islands, Northwest Hawaiian Islands, Guam, American Samoa, and the Commonwealth of the Northern Marianas Islands.

SOEST Surveyed Routes and Videos

Video images taken by SOEST along the proposed routes are of highly variable quality. The TowCam images provided only a superficial overview of the seafloor but represented about 90 percent of the coverage, whereas the ROV coverage was excellent but covered only about 10 percent of the routes surveyed. Attempts were made to correlate the video images with images of the side-scan tracks in order to understand the topography along the routes.

In the following accounts, considerable detail is presented on the video collected with the ROV owing to the excellent images of the seafloor topography and benthic and demersal fauna that were collected. In many cases, the images were of sufficient quality to allow identification of individual invertebrates or fish to species. The observer's voice on the video was often sufficient to assist in interpretation of seafloor features, such as unusual troughs or scours that might suggest evidence of feeding by beaked mammals.

In contrast to the ROV video, the variable nature of the TowCam images and lack of consistent resolution precluded any comparable analysis of these images. Although seafloor topography can generally be inferred, detailed images of the fauna were very patchy. Therefore analysis of the TowCam videos is limited to bottom type, indications of hard-bottom communities, and observations of the occasional fish or megafauna that remained in the field of view for any length of time.

Because of the variability of the height of the camera off the bottom and the speed of the camera over the bottom, an inventory of observed biological communities or megafauna was limited. Sediment type was determined by review of the SOEST (2010) Final Report, side scan data, and observations of the sediment plume when fish or the camera sled disturbed the bottom. No depth indicators, altimeters, or positioning data were included on the videos, making detailed observations and positioning of observed resources approximate at best.

Each of the various marine surveyed areas is presented with an analysis of the TowCam and ROV segments in sequence. In Appendix E, we present illustrations that show the routes of these video surveys superimposed over the side-scan sonar images collected by SOEST. These images generally demonstrate the larger scale topography that is usually confirmed or identified on the video.

Kāneʻohe to ʻIlio Pt, Molokaʻi (Preferred: TC15, TC3, R444, TC4)

TowCam 15

The first TowCam of the route between Kāneʻohe and ʻIlio Pt, Molokaʻi was recorded on two DVDs. The general features of this segment are shown in Appendix E, TC15. The depth starts at 50 m and drops off to 615 m in less than 4 miles. The initial part of the route consists of hard bottoms that transition into relic reefs with what appear to be robust benthic communities. The exposed hard bottom gradually changes over to one with a thin layer of sediment. After approximately 1 mile the sediment changes to soft mud, which continues to approximately the 3-mile mark; it changes to hard bottom covered with patches of sand. The irregular nature of this portion of the seafloor is readily seen in the side-scan image (Appendix E, TC15). Megafauna observed along this route include echinoderms, shrimp, fish, and sea pens; there are many burrows visible in the soft sediment.

TowCam 3

The second segment consists of four DVDs encompassing approximately 14 miles of the seafloor. The depth begins at ca. 615 m, increases to ca. 800 m, and then decreases to ca. 700 m. Initially, the seafloor consists of sand, then after 3 miles transitions into a rugged area of hard bottoms with boulders that appear to form ledges. This rugged area transitions to a sandy bottom, followed by a rough area of hard bottom, and then a long interval of soft muddy seafloor. These features are generally depicted in the side-scan image associated with the TowCam route (Appendix E, TC3). Megafauna observed along this route include echinoderms, shrimp, fish, sea pens, eels, anemones, starfish, and sponges. Many burrows are visible in the soft sediment areas.

R444 (Two segments: R444-1 and R444-2)

ROV Route 444 is imaged on two DVDs encompassing approximately 5.5 miles. The route corresponding to the side-scan tracks is shown in Appendix E, ROV 444.

DVD R444-1. This ROV segment is on the northern marine surveyed area from Kailua, Oʻahu, to ʻIlio Point, Molokaʻi, but in the deeper Kaiwi Channel area. The video begins at a depth of 789 m on a sandy bottom with small sand waves. The echinoid *Phormosoma bursarium*, shrimp, gray cerianthid anemones, rat-tail fish species, and eels are common throughout this area. Also seen in this area are hormathiid anemones, *Sericolophus hawaiicus* (anemone), *Kophobelemnon stelliferum* and other sea pens, sea stars, and macrurid fish. At 27:10 there is a cable crossing running east-west across the survey line, which coincides with an escarpment. There are *Callogorgia gilberti* corals at the top of the ridge, many with brittle stars associated with them. Above the ridge urchins, small fish, shrimp, and *P. bursarium* are common, and there are small patches of *C. gilberti* and brittle stars. At 40:52 a small dogfish shark (*Centrocyllium nigrum*) is seen. Then the megafauna includes gray cerianthids, *P. bursarium*, shrimp, and urchins along with occasional tubulariid hydroids, holothurians, sea stars, sea pens, rat-tail fish, eels, and hormathiids. The sea pen *K. stelliferum* becomes common, along with rat-tail fish and shrimp. At 01:48:00, rocks with corals (*Callogorgia* spp.) on some of them appear near a ledge. Also common in this area are hormathiids, rat-tail fish, shrimp, and *K. stelliferum*. The entire substrate looks to be a hard bottom with areas of sand in between outcrops. At the end of the video boulders with corals, sea pens, anemones, and tubulariids are present. The depth increases from 714 m to 720+ m (within the last couple of minutes of video; the ROV was not near the bottom when the video ended).

DVD R444-2. This segment begins at a depth of 698 m near rocky ledges with some epifaunal growth. The depth decreases within 21 minutes to 660 m. The substrate is again sand with rocky outcrops. Fauna is scarce, but includes *P. bursarium*, clumps of tubulariids or possibly corals, sea pens, *K. stelliferum*, and hormathiids. *P. bursarium* becomes common for a while, then hormathiids. An occasional rat-tail fish or eel is seen. At 52:24 the depth is 620 m and megafauna includes anemones, hormathiids, and urchins (*Aspidodiadema hawaiiensis*) with occasional eels, the crab *Cyrtomaia smithi*, gray cerianthids, and *Brisinga* sp. starfish. *P. bursarium* become common again. At approximately 1.5 hours into the video, the urchin *A. hawaiiensis* becomes more common, there are a few stalked corals, few rat-tail fish, an eel, a few *Brisinga*, and sea stars. The substrate is mostly smooth sand with occasional rocky outcrops, then it appears to be silt over relic reef or rock with brisingid seastars and urchins. The video ends at 01:45:03 at a depth of 531 m.

TowCam 4

TC4 consists of two DVDs along a route of approximately 7 miles in length, beginning at a depth of approximately 390 m, decreasing to 80 m about 2 miles offshore ʻIlio Point, Molokaʻi. The seafloor appears to consist largely of hard bottoms with possible relic reefs with sand patches. Approximately 1 mile from the end of the transect, there is a hard-bottom community consisting of whip corals or sea whip colonies. These were visible for only a short period of time but should be documented further to determine the type of community and what species are present. Megafauna observed along this transect included echinoderms, shrimp, fish, sea pens, eels, anemones, and starfish, as well as the community of whip corals or sea whips. General aspects of the seafloor and the TowCam routes are shown in Appendix E, TC4.

<u>Kāneʻohe to northwest Molokaʻi (Southern Alternative Route: TC14, TC16, TC17, R443)</u>

The proposed southern alternative marine surveyed area from Kāneʻohe to northwest Molokaʻi includes the towed video camera segments TC14, TC16, and TC17, and one ROV segment (ROV 443). The route runs southeast from Kāneʻohe to Makapoo Point, then turns and runs east to northwest Molokaʻi. General features along this route are shown in Appendix E, TC14, TC16, TC17, and ROV 443.

TowCam 14

This towed video segment runs for approximately 9 miles southeast from Kāneʻohe along the marine surveyed area to northwest Molokaʻi. Depths along this transect start at approximately 58 m at the western extent of the segment and end at a depth of 41 m at the eastern extent.

For the first 3 miles of this transect, hard bottom that contains potential coral habitat is present. The corals are located on isolated rock outcrops. The bottom changes to a soft bottom over the next 6 miles before becoming sand over hard bottom. Analysis of the video throughout much of this transect was difficult due to the height of the camera above the seafloor.

Megafauna observed along this transect included shrimp, sea pens, sponges, echinoderms, stingrays, eels, and other fish. Numerous burrows were observed in the soft sediment. The likely presence of coral communities warrants further study.

TowCam 16

This towed video segment begins at the eastern extent of TC14 and continues for approximately 11 miles. Depths along this transect begin at approximately 43 m at the western extent of the segment and drop off rapidly to 594 m at the eastern extent.

The bottom along the entire length of this segment is composed of hard bottom, sometimes covered with a thin layer of sand. The shallower sections of the segment may provide potential habitat for coral communities; sea whips and what appeared to be sea fans were present.

Megafauna observed along this transect included shrimp, sea pens, sea fans, starfish, sponges, sea whips, echinoderms, eels, and other fish. Numerous burrows were observed in the soft sediment.

TowCam 17

This towed video segment starts at the eastern extent of TC16 and continues for approximately 9 miles. Depths along this transect begin at approximately 590 m at the western extent of the segment and decrease to 268 m at the eastern extent.

The first 2 miles of this segment are composed of hard bottom covered with a thin layer of sand with sparse epifaunal growth. The bottom then changes to a soft muddy sediment until approximately 6 miles along the transect when a band of hard bottom (which appears to be relic reef) is crossed. A large patch (approximately 2 miles) of soft bottom exists between the relic reef and another band of hard bottom at about the 8-mile mark; the remainder of the segment is composed of soft sediments.

Megafauna observed along this transect included shrimp, sea pens, sea fans, starfish, sponges, sea whips, echinoderms, eels, and other fish.

R443-1

This ROV segment is on the southern marine surveyed area from Kailua, Oʻahu, to ʻIlio Point, Molokaʻi, and covers the area just north of the segment for ROV 442 (see below). It begins at a depth of 319 m on a slightly irregular sand bottom (Appendix E, ROV 443) that is initially very barren with only small worm tubes protruding from the sand. Megafauna seen along this segment includes anemones, eels, crabs, sea slugs, shrimp, and an occasional flat fish. Approximately 40 minutes into the video, slender eels or snakes, two small sharks, most likely *C. nigrum*, and a few other fish species are visible. Approximately halfway through the video, at 178 m, the bottom surface is smooth with a few tall, pinnate sea pens, eels, and shrimp. The bottom is sandy; little silt is stirred up when the ROV lands. Eels, sea stars, and small fish dominate the megafauna. At 1:33 and 128 m deep, the ROV is high off the bottom, but a glimpse of a patch of urchins and a small school of fish are visible. Urchins are common in the area in small, dense patches. The video ends after approximately 2 hours, but the ROV is high and the bottom is barely visible at 111.5 m deep.

R443-2

This segment continues toward the east, with the first 30 minutes of video revealing patches of urchins. The bottom then becomes very barren with only one sea cucumber, one small fish, and one eel. At 14:51 and 113.66 m depth, there is a very narrow patch of corals on the surface then approximately 10 small fish appear just above the seafloor. At 34 minutes, there is an eel, followed by a red scorpion-type fish, then a box fish. At 36:44 and 105.40 m depth, there is a relic reef with two lobsters and one fish hiding in the formation. Several more fish are seen in the area. At 48:40 and 99 m depth, there is another small patch of relic reef with corals and one white and black reef-type fish. The area after this is sandy with small waves and occasional boulders; the most dominant organisms are sea slugs. The last portion of the video shows occasional boulders with encrusting organisms, several maroon sea stars with thick centers and short arms, and another white and black reef fish. The video ends after 01:12:58.

Pearl Harbor to ʻIlio Pt, Molokaʻi (R445, TC5, R440/TC19, TC1, R441, TC2, R442)

R445-2

ROV 445 is stated by SOEST to consist of two DVDs, but only one was available for review (Appendix E, ROV 445). This 23-minute ROV segment was recorded just south of Pearl Harbor approaching Mamala Bay to the north. The depth begins at 263 m and ends at 180 m. The substrate is smooth sand, with a few isolated boulders. There is considerable debris in the area, including wood and other materials.

Most of the rocky substrates have encrusting organisms such as barnacles and larger frilly organisms that may be hydroids or corals. The sessile ctenophore *Lyrocteis* sp. was seen attached to the rocks. A few fish were seen, including a Kahala jack, a juvenile *Cookeolus japonicus*, a long-finned bullseye, and one other fish that was too distant to be identified. Other organisms included sponges on the debris, a crab, and some urchins. The video ends in a flat, sandy-silty area with only urchins and one more Kahala jack visible.

TowCam 5

This towed video segment was recorded moving south from Pearl Harbor. Depth at the start was approximately 422 m and ended at 487 m. Overviews of the seafloor types are shown in Appendix E, TC5. The bottom consists of patchy hard-bottom areas with large expanses of rippled sand changing to what appears to be a soft mud. Debris, some of which may be ordnance, was observed scattered along a great deal of the bottom. No established hard-bottom communities were observed along this portion of the route. Megafauna included shrimp, fish, sea pens, eels, starfish, and echinoderms. Numerous burrows were observed in the soft sediment.

R440-1

ROV Route 440 is recorded on two DVDs (Appendix E, ROV 440). The first ROV segment is south of O‘ahu along a route toward Pearl Harbor. The segment begins at the western end at a depth of 519 m and continues toward the southeast. The bottom is sandy with small waves. Several areas of ordnance and other debris were observed along the surveyed route.

The echinoderm sea star *Brisinga* sp. (very often *B. fragilis*) is commonly seen on these objects. Other megafauna common to this area includes hormathiids or stalked anemones, which resemble a fly-trap plant; urchins (*Aspidodiadema hawaiiensis*); species of rat-tail fish (*Ventrifossa*, *Coelorhynchus*); shrimp; sponges; and other anemones. Approximately halfway along this segment, eels became more common, but still were rarely seen. The sea pen *Kophobelemnon stelliferum* began appearing around the ¾ mark and was common throughout this last area surveyed. The echinoderm *Phormosa bursarium* was seen once, as was an unidentified ray. The sea pen *Hallipterus willimoesi* was common at the end of the DVD.

R440-2

The second DVD obtained along this ROV segment begins at a depth of 535 m with a bottom that has small sand waves. The echinoderms *P. bursarium* and *A. hawaiiensis*, along with rat-tail fish species, shrimp, burrowing anemones, and sea pens *K. stelliferum* and others are all common in the area. Also seen in this segment was one spider crab (*Cyrtomaia smithi*), a couple of hormathiids, a couple of eels, and a few unidentified urchins. The video ends at a depth of 540 m.

TowCam 19

The first video (DVD-1) begins at a depth of 500 m and ends at 514 m. The total viewing time is 01:55:03. The overall route is shown in Appendix E, TC19. The laser pointers are visible and the lighting appears to be good. The bottom here is sandy with waves, with scattered debris and rocks throughout. Some debris is large and appears to be canisters or ordnance. The debris may be covered with hormathiids, brisingids, sponges, and anemones. Anemones, sponges, urchins, and rat-tail fish were seen on the sediment surface. At 25:21, there are side-by-side shallow troughs that appear to be man-made as they remain parallel for the length observed.

The second video for this segment begins at a depth of 514 m and ends at 550 m. The total time of video is 01:55:44. The bottom remains soft throughout, appearing to be sand or silt with small waves. Common megafauna observed includes urchins, anemones, rat-tail fish, shrimp, and sponges with occasional brisingids and sea pens that appear to be *K. stelliferum*. There is a trough at 40:57, which appears to be of recent origin and could be a feeding trough.

The final portion of this segment (DVD-3) is a relatively flat seafloor with the depth only increasing by 2 m in the nearly 2 hours (01:51:41) of observations. The sediment remains soft silt and smooth, with scattered debris. Megafauna are the same as for the rest of the route segment, with occasional eels, a starfish, and a scorpionfish. At 32:35, a large ray with reddish pigmentation on the dorsum, a long pointed snout, and a long trailing tail was observed

TowCam 1

This towed video segment is along the marine surveyed area from Pearl Harbor to northwest Molokaʻi (Appendix E, TC1). Depths along this segment range from a starting depth of 143 m and an ending depth of 724 m. The bottom is composed of a soft sediment throughout the length of this transect. No hard-bottom communities were observed. Megafauna observed along this transect included shrimp, fish, sea pens, eels, starfish, and echinoderms. Numerous burrows were observed in the soft sediment.

TowCam 2

This towed video segment runs for approximately 9 miles along the marine surveyed area from Pearl Harbor to northwest Molokaʻi and lies east of video segment TC1 (Appendix E, TC2). Depths along this transect start at approximately 555 m at the western extent of the segment and rises to 284 m at the eastern extent. The bottom remains soft for approximately 3 miles, and then a band of hard bottom is seen before the sediment returns to a soft bottom for the remainder of the video. No established hard-bottom communities were observed along this portion of the route; debris was observed sporadically.

Megafauna observed along this transect included shrimp, fish, sea pens, eels, and echinoderms. Numerous burrows were observed in the soft sediment.

R441-1 (Appendix E, ROV 441)

This ROV segment is farther east on the same route as segment 440, between Oʻahu and Molokaʻi, and is located in the Kaiwi Channel. The segment begins at a depth of 688 m. The bottom consists of small sand waves. The sea pen *Halipterus willimoesi* (or a similar species) is common in this area. Also commonly seen are species of shrimp, gray cerianthid burrowing anemones, hormathiids, and rat-tail fish. Approximately halfway through the video there are large numbers of either siphons or tubes emerging from the substrate. The sediment is softer now as more silt is dispersed by the ROV when it holds position, and the bottom is not as wavy and has more flat areas. Hormathiids are still common, but the fan coral *Callogorgia* sp., usually associated with brittle stars, is also seen. Also seen in this segment were holothurians, shrimp, sponges, *P. bursarium*, sabellid polychaetes, urchins, sea stars, eels, and *Brisinga*. Approximately three-quarters through the video the bottom is coarse sand and has large sand waves with smaller waves between. The megafauna here includes numerous siphons or tubes, gray cerianthid burrowing anemones, a few eels, a holothurian (*Paleopatides retifer*), a crinoid, and a soft red coral.

R441-2

The segment continues east through the Kaiwi Channel toward Molokaʻi. Large sand waves are common in this area. Common megafauna includes sea pens (*H. willimoesi* or similar and *K. stelliferum*), urchins (*A. hawaiiensis*), gray cerianthid burrowing anemones, rat-tail fish species, and shrimp. Occasionally seen are eels, sea stars, *Brisinga* spp., and holothurians. One small shark, believed to be *Centroscyllium nigrum* (the comb-tooth dogfish), is seen at the beginning of this video. Approximately 30 minutes into the video, the sponge *Sericolophus hawaiicus* is fairly common. Approximately 1 hour into the video, the substrate changes from sand to rock, first with sections of carbonate pavers with sand between and then a sandy/silt veneer over rock. Most of the rocky substrate has attached corals. The corals include bamboo corals and fan corals. Also present are rare hormathiids, eels, starfish, urchins, shrimp, brittle stars, and sponges. The video ends at a depth of 714 m in an area with *H. willimoesi* and other sea pens in sedimented areas, and other patches of pavers with bamboo corals attached.

R441-3

The video begins at 714 m with sediment over a hard surface and occasional boulders. Corals and sponges are present on the rocky outcrops. Shrimp, eels, rat-tail fish, and hormathiids are rarely seen. Approximately 17 minutes into this video the substrate changes to a sandy bottom with small irregular waves and the megafauna consists of sea pens, rat-tail fish, and the urchin *A. hawaiiensis*. The sea pen *H. willimoesi* becomes quite dense for a while. There are areas of rocky outcrops with a fauna consisting of white staked sponges, brittle stars, and stalks of coral. Approximately 30 minutes into the video, the bottom becomes benign, with minimal fauna except for an occasional shrimp, fish, hormathiid, or brittle star. At approximately 42 minutes, there is a brisingid starfish, a scorpionfish (*Setarches*), eels, and a spider crab *Cyrtomaia smithi*. Approximately 50 minutes into the video, the ROV crosses a cable at 648 m depth. The video ends at approximately 1 hour and 13 minutes at 622 m depth. The last portion of the video shows an area with a lot of rocky outcrops with bamboo and black corals, basket stars, and a few fish and urchins.

R442-1 (Appendix E, ROV 442)

This ROV segment was recorded just west of Molokaʻi, along the route from the southern landing site area at Oʻahu, as the cable would approach ʻIlio Point. The initial depth is 304 m. Small sand waves with a coarse looking bottom are visible, although considerable silt is suspended when the ROV is on the bottom. The fauna is characterized by sea pens (including *K. stelliferum* and a white unidentified species); several fish species are seen, including flat fish (*Glossanodon* sp., *Antigonia* spp., a species of scorpionfish, and others); sea stars (*Calodermis* sp.); and tubularids. At 01:00:30, a trough-like feature running east-west is visible but is not mentioned in the narration. At 01:01:23, there are larger sand waves seen, as well as another trough that is mentioned in the narration as possibly being a feeding trough. There are a few similar troughs in this area. The depth is now 184 m and becoming shallower. A puffer fish, *Sphoeroides pachygaster*, is seen in this area. The substrate then becomes harder with only the sea star *Calodermis* seen; some tubularids, sponges, and hydrozoans are on rocks; one *Plesionika* shrimp was observed near a rock. The video ends at a depth of 108 m in an area where urchins are becoming common.

R442-2 (Appendix E, ROV 442)

This is the second DVD along this ROV segment, and it begins in the area where urchins are common. The bottom is sand with occasional rocky outcrops. The urchin area ends and fauna become very scarce. There are a few boxfish and urchins for the first 30 minutes. Urchins again become abundant at 37 minutes into the video and continue until 41 minutes. This area also has a few sea slugs and nudibranch egg masses. A fish, *Canthigaster coronatus*, and a few baby squid are seen, with some hydrozoa or black corals. After this, the bottom changes to an area with a narrow band of corals visible on the surface. The video ends approximately 1 hour in at 83 m deep, and the bottom is covered with chlorophyta (green algae). There are a few fish and sea stars in the area.

Alternate extension to Laʻau Pt, Molokaʻi (TC18, R448, R449)

TowCam 18

There are three DVDs for this segment. Seafloor details are shown in Appendix E, TC18.

DVD 1 begins at a depth of 604 m and ends at 551 m. The total running time is 01:51:34. The bottom is mostly rock and boulders interspersed with patches of soft, silty sediment. The rocks and boulders have attached anemones, urchins, live corals, brinsingids, and other encrusting organisms. The soft areas have sea pens, rat-tails and other small fish, burrowing anemones, and shrimp. An occasional eel or larger fish was also observed. The TowCam crossed two cables; the first approximately 30 minutes in, and the second 8 minutes before the end of the video.

Depths for DVD-2 begin at 553 m and ends at 364 m. The total running time is 01:50:03. The video begins in an area of soft sediment with rat-tail fish, *K. stelliferum* and other sea pens, burrowing anemones, small fish, and shrimp. Approximately 11 minutes into the video, a small dogfish is seen, probably *C. nigrum*. Approximately 20 minutes in, the bottom transitions to rock with ledges and boulders. Some of the boulders have anemones, urchins, and live corals attached, but most appear to be bare. Very few fish are observed, but that might be due to the height of camera system. Occasional eels, flat-fish, and holothurians are observed.

Depths on DVD-3 begin at 362 m and end at 267 m. The total running time is 20:03. The area is sand with waves and is a habitat for sea pens, anemones, rat-tail fish, other small fish, and eels. All were observed in low numbers. A few pieces of unattached, floating green algae were seen. A flat-fish and a badge star were also observed.

R448-1 (Appendix E, ROV 448)

Three DVDS are available for ROV 448. The first video begins at a depth of 43 m and is over a hard bottom, coral reef area with very little sediment. The quality of the video is variable. Sometimes the ROV is close to the bottom and the area is strongly illuminated with the ROV lights. At other times, the ROV is high off the bottom and the images are obtained with only ambient light, thus obscuring details. Sometimes while in the shallow areas (the first hour of video), the ROV is being jerked up and down, presumably due to translation of the ship movements to the cable and ROV; during these movements, the ROV often looks up at the cage thus precluding any seafloor images.

In the shallow area there is some floating algae as well as attached algae. The presence of floating algae suggests low current velocities. There are numerous reef fish swimming above and around the corals. The ringtail surgeonfish (*Acanthurus blochii*) was very common; and the ROV was stopped to observe whitespine surgeonfish (*Acanthurus dussumieri*) going into holes in the corals. Puffer fish were also seen. At 23:12 an eel was observed; it was mottled and possibly a type of moray eel. Approximately 40 minutes into the video the bottom has more sediment in between the hard areas, and then at 48:25 a ledge was present with sediment present at the bottom. Once the depth increases, the lighting is generally only from ambient light, making everything appear blue. The ROV was only rarely paused or stopped, and only then was the lighting sufficient to impart good coloration on the objects. There was less live coral here, more attached algae, no reef fish, and little other visible evidence of life. At 01:53:38 the bottom changes to sediment over a hard bottom, covered with algae. The video ends at a depth of 73 m after 02:04:39.

R448-2

This ROV segment was taken along the marine surveyed area running west of Molokaʻi on the offshore route and covers a very steeply sloped segment. The video is not being taken with the lights from the ROV but from the top lighting supplied by the cage. It begins at a depth of 71 m. The substrate appears to be a thin layer of sand or silt over rock, and approximately 50 percent of the bottom is covered by green algae that looks like *Ulva*. Other than the algae little life is seen: one white sponge, one urchin, two puffer fish, and two sea stars. At 30:00 minutes and 93 m deep, the bottom appears less hard, with some circular depressions in the sediment and more algae floating than attached. At 45:00 and 102.60 m deep, there are no attached algae but many floating just above the substrate. The substrate appears to be all sand with occasional small rocks, which may have algae attached. The entire route is patchy with areas where floating algae alternating between dense and sparse; the substrate appears sandy with small waves. From this point on, the only living organisms observed until the video ends at approximately 2 hours (at a depth of 246.83 m) are two puffer fish, one flat fish, one urchin, one sea pen, a small silver fish in a depression, and three sea stars (*Calodermis spectabilis*).

R448-3

The third video in the segment begins where the first ended, in an area where floating algae can be dense or sparse, but with very little animal life observed. The video is approximately 14 minutes long and ends at a depth of 282.16 m. Organisms observed include two sea pens, two urchins, two sea stars (*Calodermis spectabilis*), and a *Glossanodon* sp. fish.

R449 (Appendix E, ROV 449)

This single video began along a marine surveyed area, but due to mechanical issues quickly went off route. The majority of the video shows only the seafloor in general rather than a specific route of interest. The video is footage of the area along the same route as TC18 to start, then gradually transitions over to an area south of the video captured during R441. Although the video is not along any proposed or alternate route it depicts the typical fauna for that particular area and was deemed important to the overall understanding of benthic habitat. The ROV approaches the bottom approximately 5 minutes into the video, at 622 m depth. The substrate appears to be a smooth sandy-silt. The fauna common to the area includes brisingid starfish, sponges, and urchins. A few cup corals, a small fish, one eel, one shrimp, and one hormathiid anemone are observed. The video ends after 20 minutes when the mechanical issues arise, but in the last 5 minutes the substrate appears to be carbonate rock under a thin veneer of sediment, and there are a couple of gorgonian corals with brittle stars attached to the substrate and a few anemones and tubulariids.

<u>Alternate extension to Laʻau Pt, Molokaʻi (TC6, R446, TC7, TC12)</u>

TowCam 6 (Appendix E, TC6)

This towed video segment is along the marine surveyed area from Pearl Harbor to SW Molokaʻi. This segment is approximately 20 miles long and lies east of video segment TC19 and is predominantly situated in the middle of the Kaiwi Channel. Depths along this transect start at approximately 510 m at the western extent of the segment decreasing to 616 m and then rising to 466 m at the eastern end. The bottom consists of soft muddy sediment throughout the length of this video transect. At the eastern extent, a series of sediment waves coincide with a decrease in depth and possible higher current velocities at the base of Penguin Bank. Debris including what appeared to be ordnance was observed sporadically along the route.

No established hard-bottom communities were observed along this portion of the route. The fauna observed includes shrimp, urchins, anemones, small crabs, fish, sponges and bases of sponges, and sea pens. A few holothurians and hormathiids were observed. Numerous burrows were observed in the soft sediment.

R446-1 (Appendix E, ROV 446)

This ROV segment was recorded approximately halfway along the southern marine surveyed area from Oʻahu to Molokaʻi, moving west to east leaving Kaiwi Channel and onto Penguin Bank. The video begins at a depth of 515 m on a bottom with small, irregular sand waves. The fauna most common in the area includes holothurians, gray cerianthids, shrimp, sea pens (including *K. stelliferum* and others), and anemones. Other fauna occasionally seen in the area includes sea slugs, eels and other fish species, hormathiid anemones, sea stars, squid, and colonial salps. There are also stalked sponges (*Cericolophus* spp.) and bases of the same seen in the video. At 21:42, a small dogfish shark (*C. nigrum*) is seen near two eels. At 23:36 minutes at a depth of 490 m, there are several small troughs that may be feeding troughs. These are encountered again at 33:10, 41:03 (449 m), 53:22 (400 m), and 01:07:00 (327 m). The substrate throughout this area is generally sandy with large waves or ridges with occasional rocks and boulders. At 01:09:08, there is a small school of tiny fish (*Glossanodon* spp.) just before coming to a ledge (312 m deep). Hundreds are then seen in a very small area that does not have a lot of other fauna except a few sea pens. At 01:16:38, sea pens (*H. willimoesi* or similar) become very common, and several large boulders are seen. At one of the boulders at 262 m depth, a *Pontinus macrocephalus* (large-headed scorpionfish) is seen with a butterfly-type fish on top of it. The patchy rocky/boulder areas with sand in between continue through the end of the video. The last portion is devoid of life, though there are some algae growing on rocks. The video ends at a depth of 54 m.

TowCam 7 (Appendix E, TC7)

DVD-1 begins at a depth of 42 m and ends at 47 m after a total time of 01:50:03. The lighting during this segment is of very poor quality and everything appears blue due to the lack of light. The bottom here is hard, relic reef with a slight sediment covering. There are areas with live corals and, when the towcam is close enough, small fish can be seen swimming above the coral. Other reef-type fish are observed but cannot be identified. There are patches of softer sediment, but not much megafauna can be observed due to the poor quality of the video.

DVD-2 shows a relatively flat bottom, changing only from 49 m at the start to 45 m at the end of the 01:52:38 long video. The bottom is similar to that seen in DVD-1 with relic reef and areas with live coral. Some reef-type fish can be seen but not identified.

DVD-3 lasts only 52.5 minutes and the depth varies only slightly from 46.35 m at the beginning to 24 m at the end. The quality continues to be poor with a lack of light making everything look blue. The bottom is the same as in the first two videos. At 31:45, there is a line across the bottom that is either a cable or rope.

TowCam 12 (Appendix E, TC12)

DVD-1 covers fairly flat ground, with a beginning depth of 49 m and ending depth of 55 m. The total time of video is 01:50:02. The area has all hard bottom, with some sediment cover over rock; the depth of the sediment varies from a thin coating to deep enough for burrowing organisms. Green algae are attached to some of the rocks and there are varying amounts of floating green algae (*Ulva*). There is not much life apparent; there were very few fish, most of them small, including one puffer and two other larger fish in the 2 hours of video. Other organisms observed included anemones (burrowing and attached), a few small urchins, a few starfish, and a couple of small crabs. Barnacles, many of them dead, were attached to several of the rocks. The rock is not smooth and could be relic reef.

DVD-2 continues with a relatively flat bottom that begins at a depth of 55 m and ends at 52 m. The total time of the video is 01:50:16. It is a hard bottom interspersed with areas of softer sediment and the fauna is similar to DVD-1. At 01:07:00 there are four larger fish observed, which appear to be wrasse. At 01:19:45 there is a trench, possibly from a cable.

DVD-3 starts at a depth of 53 m and ends at a depth of 56 m. The total length of the video is 01:49:40. The bottom is similar to that seen in the first two DVDs. There appears to be a lack of current as it remains quite still. A few large, unidentified fish are seen, as well as some attached algae. The height from the bottom is too high to be able to discern detail, and the lighting is poor.

<u>ʻIlio Pt, Molokaʻi to Laʻau Pt, Molokaʻi (TC13)</u>

The marine surveyed area from northwest Molokaʻi to Lānaʻi includes the following towed video camera segments: TC13, TC8, and TC9. TC13 encompasses the entire western side of Molokaʻi and includes three DVDs.

TowCam 13 (Appendix E, TC13)

This towed video segment runs for a distance of approximately 9 miles from SW Molokaʻi to the proposed landing site area at northwest Molokaʻi. The depths along the route range from 25 m at the southern end descending to 80 m and then rising to 50 m at the northwest terminus of the segment.

The southern portion of this segment is located on Penguin Bank and is composed of hard bottom supporting what appears to be a significant megafaunal community of corals and sponges. This is an area that should be documented further to evaluate any potential impacts. This hard-bottom community extends to the northwest approximately 3 miles before changing to hard bottom with sand patches for an additional 1.5 miles. At that point, it changes to a soft bottom until the approach to northwest Molokaʻi where large sand waves with hard-bottom patches in the sand wave troughs are present.

Megafauna observed along this transect included echinoderms, shrimp, fish, sea pens, eels, anemones, starfish, holothurians, sponges, and corals. Floating detritus in the water column suggest that portions of this segment are subjected to what appears to be a fairly significant current.

Laʻau Pt, Molokaʻi to Lānaʻi (TC8, TC9); TC9 Extension to S. Molokaʻi (R447)

TowCam 8 (Appendix E, TC8)

This video segment runs from SW Molokaʻi east approximately 20 miles to the intersection of the marine surveyed area from Molokaʻi to Lānaʻi. Depths range from 34 m at the western extent of the segment to 280 m going downslope from Penguin Bank. The first 2 miles of the western extent of the segment consists of a hard-bottom community with possible corals and sponges, followed by a series of dramatic and prominent sand waves that extend for about a mile before changing back to a hard bottom with an apparently thriving hard-bottom community. This feature extends for approximately another mile before changing to a hard bottom covered in a thin layer of sediment. After another 6 miles, at approximately halfway along this segment, the bottom turns to a soft mud for about 4 miles then turns to patchy hard bottom before turning back to a soft mud for the final 2 miles of this segment.

Megafauna observed along this transect included echinoderms, shrimp, sea pens, eels and other fish including a stingray, anemones, starfish, holothurians, sponges, and corals. Numerous burrows were observed in the soft sediment. Much of the western portion of this segment appears to be exposed to fairly high current velocities.

TowCam 9 (Appendix E, TC9)

This towed video segment runs from Molokaʻi south approximately 9 miles to Lānaʻi. Depth along this segment ranges from 180 m at the northern extent to 282 m at the end of the video. The last DVD of this towed video segment was not available for viewing; this portion of the video viewed covered the approach to Lānaʻi. The entire portion of the observed towed video along this segment consisted of a soft mud.

Megafauna observed along this transect included shrimp, fish, sea pens, eels, starfish, and echinoderms. Numerous burrows were observed in the soft sediment.

R447-1 (Appendix E, ROV 447)

This ROV segment shows video obtained along the route from the south of Molokaʻi toward Lānaʻi; it is the portion of the route closest to Molokaʻi and includes perhaps up to 1 mile in state waters. The video begins at a depth of 194 m in an area silty substrate pockmarked with holes or burrows. Many small (<1 inch) very long-armed crabs are identified by the narrator as squat lobsters seen scurrying across the bottom as well as another unidentified small crab with shorter arms. The sea star *Caloderma spectabilis* is fairly common, along with holothurians, white sea pens, and flat fish. A crinoid, a small unidentified fish, a *Lyrocteis* ctenophore, and an octopus are also seen. At 17:58 and 184 m deep, a suspected feeding trough is seen, then another at 23:49 (183 m) and a third at 24:54 (183.20 m). At 25:40 a cable perhaps from a tug or barge is seen curled up and partially buried on the seafloor. It has created a small-scale artificial reef environment with several *Antigonia* spp. and other small fish, as well as a larger scorpionfish, a puffer, and several encrusting organisms including anemones and sponges. No crabs can be seen in the video at this point, but it is possible that the ROV is simply too high off the bottom to see them since they are so small. There are a few more suspected feeding troughs. Some scattered bivalves are seen on the seafloor; they have a light brown exterior and are white inside, but when the ROV approaches they close their valves. Another octopus is seen as well as another *Antigonia* fish and a holothurian. At 37:24 and 175 m deep, the ROV hovers over a delicate, slender, branching white organism that is identified in the narration as a black coral. There are several of these seen along the route from this point through the end of the video. At 37:40 (175 m) a sandbar shark (*Carcharinus pufeus*) is encountered. While the ROV is following it, a puffer fish is observed. From this point on, through 01:13:50, several more suspected feeding troughs are observed. The bottom remains sandy-silt with few organisms except for a few black corals and bivalves, a few puffer fish, flat fish, and *Antigonia* fish, occasional cerianthids, a lizard fish, a few sea stars, and an urchin. The video ends after 1.5 hours at a depth of 90 m in an area where the water column is becomes very murky.

Lānaʻi to Maui (TC10)

TowCam 10 (Appendix E, TC10)

This towed video segment runs from Lānaʻi north and then west for approximately 25 miles toward Maui. Ten separate DVDs cover depths that range from 28 m near Lānaʻi to 232 m at the deepest point before ending at a depth of 190 m.

The nearshore Lānaʻi segment consists of a hard bottom that appears to support a thriving hard-bottom community and possible coral habitat. This hard bottom extends for a short distance, and then as the camera proceeds downslope away from the coast, the bottom turns to soft muddy sediment that continues for approximately 6 miles. It then becomes what appears to be hard bottom covered with a thin layer of sediment. This pattern of soft sediment turning to a thinly covered hard bottom continues for approximately the first 15 miles until the proposed route takes a turn to the northeast; at that point, soft sediment and sand waves were observed for approximately 2 miles before turning to hard bottom again. For the next 12 miles or so the bottom is a soft muddy sediment before changing to a hard bottom where the video coverage ended.

Megafauna observed along this transect included echinoderms, shrimp, sea pens, eels and other fish including stingrays, anemones, starfish, holothurians, sponges, and corals. Numerous burrows were observed in the soft sediment. Portions of this area appear to be exposed to fairly high current velocities.

TC11 Alternate Connector to Maui in Kalohi Channel

Five DVDs are included for TC11, which is an alternate route between TC9 and TC10 toward Maui in the Kalohi Channel. Topographic features may be found in Appendix E, TC11.

DVD 1 begins at a depth of 229 m and finishes at 170 m after 01:37:38. The seafloor is all sandy silt. Seastars are very common as are flatfish; long white sea pens; possibly wire corals; and rat-tail fish, eels, and urchins. At 22:32 there is what appears to be a potential feeding trough. *Calodermis. spectabilis* was observed in the last hour of the video and the bottom was pockmarked with holes, possibly burrows of crustaceans.

DVD 2 begins at a depth of 167 m and concludes at 102.5 m after 01:53: 48. The seafloor is soft with numerous burrows present. Megafauna were sparse, including a few anemones and urchins. A few flatfish, shrimp, and sea pens were observed together with some drifting algae. At 01:02:04, small but dense patches of rounded objects that might represent urchins were observed. Wire corals were observed 01:18:55 into the segment and at 01:46:48 a partially buried length of wire was noted.

DVD-3 begins at a depth of 102 m and ends at 59 m. The total time is 01:53:27. The bottom is smooth, soft sediment with few burrows. The megafauna included a few small fish, shrimp, urchins, and anemones, with occasional rat-tail fish and eels. There were some loose, unattached algae floating just above the bottom. Approximately 18 minutes in, there is a patch of small rocks with algae on some. There is no coverage of the bottom at all from approximately 50 minutes to 1:05 due to the camera being too far off the bottom. When the bottom is seen again at 01:05, there are a few rocks and algae, and then it becomes a hard bottom with some sediment covering the rock. No megafauna were seen except anemones in the sandy patches and one holothurian.

DVD-4 begins at a depth of 60 m and ends at 198 m. The total running time is 01:53:52. The depth increases quickly in the beginning and reaches 122 m only 15 minutes into the video. The segment begins with a hard-bottom area with some attached algae and some sedimentation. There are patches of sand with flat-fish, anemones, sea pens, and a few eels. After 15 minutes, the bottom appears to be all soft silt and very smooth. At 01:13:49 there is a sandbar shark, and then an eel and another unidentified fish. Anemones are common. At 01:48:20 a large ray is observed. The video ends in an area with waves and sea pens.

The total time on the last video, DVD-5, is only 13 minutes and 33 seconds, and begins at a depth of 199 m and ends at 198 m. The bottom appears to be rippled sand with anemones, urchins, small fish, and sea pens. One large, solitary branching organism is observed; this may be a coral.

Summary of DVD Observations

Illustrations showing the DVD tracks overlying the side-scan images are presented in Appendix E. The main routes are shown in Figure 3.7-1. The main features illustrated in the Appendix E images include basic seafloor topography and sediment types. In several instances with the TowCams, reef habitats have either been identified or inferred. The variable nature of the towed camera images precluded a comprehensive assessment of biological features. The ROV images, however, are of very high quality and greater detail of the seafloor topography and benthic organisms is available.

Along the northern route from Kāneʻohe to Molokaʻi, there were areas of hard bottom and relic reefs that might suggest living corals are present, especially on TowCam 4. Relic reefs were observed in ROV 444 along the same route. Similar habitats were suggested along the southern alternative from Kāneʻohe to Molokaʻi.

The southern connection from Pearl Harbor to Molokaʻi has already been identified by SOEST as having the seafloor offshore Pearl Harbor with considerable ordnance and UXO (Taylor 2010a–b). The remainder and greatest extent of the route to Molokaʻi mostly consists of soft bottoms. The more southern connection passes over Penguin Bank where sand waves dominate. Hard bottoms and probable live coral were observed on TowCam 7 and 12. This route also crosses the greater part of the HIHWNMS.

TowCam 13 runs along the west coast of Molokaʻi and begins with hard bottoms and potential reef communities, but continues with largely soft bottoms. This route lies entirely in State waters. TowCam 8 connects this route along the southern side of Molokaʻi into the Kalohi Channel and toward Lānaʻi with a connection to TowCam 9. Most of the routes covered by TowCams 8 and 9 appear to be soft bottoms; possible coral habitats were noted at the beginning of TowCam 8, however. ROV 447 is a short extension into state waters on the southern side of Molokaʻi where precious black corals were identified.

TowCams 11 and 10 include routes from Lānaʻi to Maui along the southern margins of Molokaʻi and into the Pailolo Channel. The topography along TowCam 11 appears to consist mostly of soft bottoms. The seafloor along TowCam 12, however, consists largely of hard bottoms and relic reef habitats.

The ROV images provide the best examples of seafloor fauna. Summaries of these are presented in the actual video descriptions presented above. Many organisms were identified to species; others were only identified to higher taxonomic levels or in many instances to general categories. Table 3.7-1 provides occurrences of common organisms for each of the ROV segments. Images of some of these are presented in Figures 3.7-2 and 3.7-3.

Marine Mammals and Turtles in Hawaiian Ocean Waters

All marine mammals are protected under the MMPA, which was established in 1972 to protect marine mammals by prohibiting take in U.S. waters and by U.S. citizens on the high seas, and by the importation of marine mammals and marine mammal products into the U.S. In addition, several species are listed under the ESA as either endangered or threatened. Those marine mammals that are known to occur around Hawaiʻi but are not listed under the ESA are given in Table 3.7-2 and detailed in Appendix F. All Pacific sea turtles are designated under the ESA as either threatened or endangered and are discussed in the following section.

Endangered and Threatened Species

A large number of ESA-listed species occur in the Pacific Islands Region (Hawaiʻi, Guam, Northern Marianas, American Samoa, and Pacific Remote Island Area), including many widely distributed marine species. NMFS has ESA jurisdiction over marine species, while USFWS has ESA jurisdiction over terrestrial and freshwater species, including the terrestrial life history stages of sea turtles.

All Pacific sea turtles are designated under the ESA as either threatened or endangered (Table 3.7-3). The olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles are currently listed as threatened. Leatherback (*Dermochelys coriacea*) and hawksbill (*Eretmochelys imbricata*) sea turtles are classified as endangered. These five species are highly migratory or have a highly migratory phase in their life history (NMFS 2001). Green and hawksbill turtles are known to occur in nearshore waters around Hawaiʻi and loggerhead, leatherback, and olive ridley turtles have been incidentally caught by pelagic longline vessels based in Hawaiʻi (NMFS 2005). Generally, impacts to sea turtles in the Western Pacific Region include natural ecosystem variability (e.g., regime shifts) and predation, as well as anthropogenic impacts that include loss and degradation of habitat (especially nesting and foraging sites), illegal poaching, disturbance (e.g., from tourism, coastal development, etc.), fishery interactions (e.g., hookings or gear entanglements), and marine debris entanglements (NMFS and WPFMC 2009).

Cetaceans listed as endangered under the ESA that have been observed in the Western Pacific Region include the humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), and sei whale (*B. borealis*). In addition, one endangered pinniped, the Hawaiian monk seal (*Monachus schauinslandi*), occurs in the region (Table 3.7-3). Impacts to marine mammals in the Western Pacific Region include naturally caused ecosystem variability (e.g., regime shifts), shark predation, habitat degradation (e.g., birthing and calving areas), wildlife viewing activities that disrupt behavior, fishery interactions (e.g., gear entanglements), marine debris entanglements, and vessel collisions (NMFS and WPFMC 2009).

<u>Turtles</u>

Leatherback Turtles

Leatherback turtles (*Dermochelys coriacea*) are widely distributed throughout the oceans of the world and are found in waters of the Atlantic, Pacific, and Indian Oceans; the Caribbean Sea; and the Gulf of Mexico (Dutton et al. 1999). Local extinctions, especially of island populations, and the demise of once-large populations throughout the Pacific, are the reason for their listing. In all areas where leatherback nesting has been documented, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago. The collapse of these nesting populations was most likely precipitated by a tremendous over harvest of eggs coupled with incidental mortality from fishing (Sarti et al. 1996).

Leatherback turtles are the largest of the marine turtles, with a shell length often exceeding 150 cm (NMFS and USFWS 1998a). This species leads a completely pelagic existence, foraging widely in temperate waters except during the nesting season when gravid females return to tropical beaches to lay eggs. Males are rarely observed near nesting areas, and it has been proposed that mating most likely takes place outside of tropical waters, before females move to their nesting beaches (Eckert and Eckert 1988). Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Eckert 1998). In a single year, a leatherback may swim more than 10,000 km (6,200 miles) (Eckert 1998). Satellite telemetry studies indicate that adult leatherback turtles follow bathymetric contours over their long pelagic migrations and typically feed on cnidarians (jellyfish and siphonophores) and tunicates (pyrosomas and salps), and their commensals, parasites, and prey (NMFS and USFWS 1998a).

Females are believed to migrate long distances between foraging and breeding grounds, at intervals of typically 2–4 years (Spotila et al. 2000). The nesting season generally extends from November to February. Recent information on leatherbacks tagged off the west coast of the U.S. has revealed an important migratory corridor from central California to south of the Hawaiian Islands, leading to western Pacific nesting beaches (NMFS 2004). Leatherback turtles are not known to nest in the Hawaiian Islands; however, anecdotal reports indicate that they have been sighted within U.S. EEZ waters (NMFS 2001).

Loggerhead Sea Turtles

The loggerhead sea turtle (*Caretta caretta*) is characterized by a reddish-brown, bony carapace, with a comparatively large head that is up to 25 cm wide in some adults. Adults typically weigh between 80 and 150 kg, with an average curved carapace length (CCL) between 95 and 100 cm (Dodd 1988; Eckert 1993).

For their first years of life, loggerheads forage in open-ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans, mollusks, fish, and algae. As they age, loggerheads begin to move into shallower waters, where, as adults, they forage over a variety of benthic hard- and soft-bottom habitats (reviewed in Dodd 1988).

The loggerhead sea turtle is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. In general, during the last 50 years, North Pacific loggerhead nesting populations have declined 50–90 percent (NMFS and WPFMC 2009). Loggerhead turtles occur around the Hawaiian Islands and their migrations are known to track through the Hawaiian Archipelago (Wallace et al*.* 1999).

Green Sea Turtles

Green sea turtles (*Chelonia mydas*) have a light to dark brown carapace, sometimes shaded with olive, and can exceed 1 m in carapace length and 100 kg in body mass. Females nesting in Hawai‘i averaged 92 cm in straight carapace length (SCL). It is estimated that female green sea turtles reach sexual maturity at 25 years of age (Eckert 1993). Most adult green sea turtles have an almost exclusively herbivorous diet, consisting primarily of seagrass and algae (Wetherall 1993), although those along the east Pacific coast seem to have a more carnivorous diet.

Green sea turtles are a circumglobal and highly migratory species, nesting and feeding in tropical/subtropical regions. Their range can be defined by a general preference for water temperature above 20°C. Green sea turtles are known to live in pelagic habitats as post-hatchlings and juveniles, feeding at or near the ocean surface. The nonbreeding component of this species can lead a pelagic existence many miles from shore. The underwater resting sites include coral recesses, undersides of ledges, and sand bottom areas that are relatively free of strong currents and disturbance from natural predators and humans. Near the Hawaiian mainland, the foraging and resting areas for adults usually occur at depths greater than 10 m, but probably not normally exceeding 40 m.

The breeding component of this species lives primarily in bays and estuaries, and is rarely found in the open ocean. Most migration from rookeries to feeding grounds is via coastal waters, with females migrating to breed only once every 2 years or more (NMFS and WPFMC 2009).

Green turtles in Hawai‘i are considered genetically distinct and geographically isolated. In Hawai‘i, green turtles nest on six small sand islands at French Frigate Shoals, a crescent-shaped atoll situated in the middle of the Hawaiian Archipelago (Northwestern Hawaiian Islands; Balazs et al. 1992). Long-term monitoring of the population shows that there is strong island fidelity within the regional rookery.

After years of exploitation, protection under the ESA and recovery programs have resulted in the nesting population of Hawaiian green turtles showing a gradual increase (Balazs and Chaloupka 2004). In three decades, the number of nesting females at East Island increased from 67 nesting females in 1973 to 467 nesting females in 2002. Balazs and Chaloupka (2004) concluded that the Hawaiian green sea turtle stock is well on the way to recovery following 25 years of protection. This increase is attributed to increased female survivorship since the harvesting of turtles was prohibited, in addition to the cessation of habitat damage at the nesting beaches since the early 1950s (Balazs and Chaloupka 2004).

The green turtle was listed under the ESA on July 28, 1978. The breeding populations in Florida and the Pacific coast of Mexico are listed as endangered; elsewhere the species is listed as threatened. Critical habitat was designated in 1998 for green turtles in coastal waters around Culebra Island, Puerto Rico (NMFWS and USFWS 1998b).

Hawksbill Sea Turtles

Hawksbill sea turtles (*Eretmochelys imbricata*) are circumtropical in distribution, generally occurring from latitudes 30°N to 30°S within the Atlantic, Pacific, and Indian Oceans and associated bodies of water (NMFS and USFWS 1998c). Hawksbills have a unique diet of sponges (Meylan 1988).

As a hawksbill turtle grows from a juvenile to an adult, data suggest that the turtle switches foraging behaviors from pelagic surface feeding to benthic reef feeding (NMFS and WPFMP 2009). As with other sea turtles, hawksbills will make long reproductive migrations between foraging and nesting areas but otherwise they remain within coastal reef habitats (NMFS and WPFMP 2009).

The hawksbill turtle was listed under the ESA as endangered in 1970. In the Pacific, this species was rapidly approaching extinction primarily due to the harvesting of the species for its meat, eggs, and shell, as well as the destruction of nesting habitat by human occupation and disruption (NMFS and USFWS 1998c).

Hawksbill turtles are known to reside and nest in the main Hawaiian Islands (MHI), primarily on several small beaches on the Island of Hawaiʻi (Balazs et al*.* 1992). Although the local population has increased, only a few dozen sea turtles nest each year.

Olive Ridley Sea Turtles

Olive ridley turtles (*Lepidochelys olivacea*) are olive or grayish green above, with a greenish white underpart, and adults are moderately sexually dimorphic. Olive ridley lead a highly pelagic existence (NMFS and WPFMC 2009), foraging throughout the eastern tropical Pacific Ocean, often in large groups or flotillas. Young turtles move offshore and occupy areas of surface-current convergences to find food and shelter among aggregated floating objects until they are large enough to recruit to the nearshore benthic feeding grounds of the adults.

The Olive ridley turtle is omnivorous, and identified prey include a variety of benthic and pelagic prey items such as shrimp, jellyfish, crabs, snails, and fish, as well as algae and sea grass (Marquez 1990). Olive ridley turtles are also known to forage at great depths (Eckert et al. 1986).

Direct harvest of adults and eggs, incidental capture in commercial fisheries, and loss of nesting habits are the main threats to the olive ridley's recovery (NMFS and USFWS 1998d). There have been two reports of single nests in Hawaiʻi. The first was in 1985 on Maui, but the eggs did not hatch; the second was in 2002 on the Island of Hawaiʻi (NMFS and WPFMC 2009).

<u>Marine Mammals</u>

Humpback Whale

Humpback whales (*Megaptera novaeangliae*) occur off all eight main Hawaiian Islands during the winter breeding season, but particularly within the shallow waters of the four-island region (Kahoolawe, Molokaʻi, Lānaʻi, and Maui); the northwestern coast of the island of Hawaiʻi; and the waters around Niihau, Kauai, and Oʻahu. The HIHWNMS is located within waters from the shoreline to the 200-m isobath around the islands of Hawaiʻi, Maui, Molokaʻi, and Lānaʻi, and parts of Oʻahu and Kauai. The primary purpose of the sanctuary is to protect humpback whales and their habitat.

Humpback whales usually winter in nearshore waters of 200 m or less. Mature females are believed to conceive on the breeding grounds one winter and give birth the following winter. Genetic and photo identification studies indicate that, within the U.S. EEZ in the North Pacific, at least three relatively separate populations of humpback whales migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Hill and DeMaster 1999). The Central North Pacific stock of humpback whales winters in the waters of the main Hawaiian Islands (Hill et al. 1997) October through May.

The humpback whale population in the North Pacific Ocean basin is estimated to contain 6,000 to 8,000 individuals (NMFS and WPFMC 2009). There is evidence that the Central North Pacific stock has increased in abundance between the early 1980s and early 1990s but its individual status is unknown (Hill and DeMaster 1999).

Humpback whales face a series of threats including entanglement in fishing gear (bycatch), ship strikes, whale watch harassment, habitat impacts, and proposed harvest. Potential entanglement from gear from several fisheries can occur on their long migration from Hawaiʻi to Alaska. Humpbacks in Hawaiʻi have been observed entangled in longline gear, crab pots, and non-fishery-related lines.

Inadvertent ship strikes can injure or kill humpbacks. NOAA Fisheries has verified mortality related to ship strikes in the Gulf of Maine and in southeastern Alaska. Ship strikes have also been reported in Hawaiʻi. Shipping channels, fisheries, and aquaculture may occupy or destroy humpback whale aggregation areas. Recreational use of marine areas, including resort development and increased boat traffic, may displace whales that would normally use that area. In Hawaiʻi, acoustic impacts from vessel operation, oceanographic research using active sonar, and military operations are also of increasing concern.

In June 1970, humpback whales were designated as “endangered” and listed under ESA when it was established in 1973. In 1972, humpbacks were provided additional protection under the MMPA and were considered “depleted” in 1973. Under the MMPA, threats to humpbacks are mitigated by regulations implementing the Pacific Offshore Cetacean Take Reduction Plan and the Atlantic Large Whale Take Reduction Plan.

Sperm Whale

Sperm whales (*Physeter macrocephalus*) are found in tropical to polar waters throughout the world. They are among the most abundant large cetaceans in the region. The average body length ranges from 12 to 15 m. Sperm whales are characterized by their brown/gray coloration, relatively short dorsal fin, wrinkled appearance of tail stock, and unique blow pattern.

Sperm whales have been sighted around several of the Northwestern Hawaiian Islands (Rice 1960) and off the main islands of Hawaiʻi (Lee 1993). In the early to mid-nineteenth century, Hawaiʻi was the center of the whaling operations targeting sperm whales.

Blue Whale

The blue whale (*Balaenoptera musculus*) is the largest living animal. Blue whales can reach lengths of 30 m and weights of 160 tons (320,000 lb). They occur in all oceans, usually along continental shelves, but can also be found in the shallow inshore waters and on the high seas. The stock structure of blue whales in the North Pacific is uncertain (Forney et al. 2000). The status of this species in Hawaiian waters is also unknown, and insufficient data are available to evaluate trends in abundance (Forney et al. 2000).

At least two sightings of blue whales have been reported by Hawai‘i-based longline vessel crews to the north of Hawai‘i, and acoustic recordings made off O‘ahu and Midway Islands have reported blue whales somewhere within the EEZ around Hawai‘i (Thompson and Freidl 1982).

Fin Whale

Fin whales (*Balaenoptera physalus*) are found throughout all oceans and seas of the world from tropical to polar latitudes (Forney et al. 2000). Although it is generally believed that fin whales make poleward feeding migrations in summer and move toward the equator in winter, few actual observations of fin whales in tropical and subtropical waters have been documented, particularly in the Pacific Ocean away from continental coasts (NMFS and WPFMC 2009). One sighting was made of fin whales—a mixed group of adults and calves—almost due south of O‘ahu between 18–19° Latitude documented by an observer aboard a Hawai‘i-based longline fishing vessel.

There is insufficient information to accurately determine the population structure of fin whales in the North Pacific, evidence exists of multiple stocks. The status of fin whales in Hawaiian waters relative to the optimum sustainable population is also unknown, and insufficient data exists to evaluate trends in abundance (Forney et al. 2000).

Sei Whale

Sei whales (*Balaenoptera borealis*) have a worldwide distribution but are found mainly in cold temperate to subpolar latitudes rather than in the tropics or near the poles. Their distribution is offshore and they do not appear associated with coastal features, and they are rarely seen in Hawaiian waters. No data are available on trends in sei whale abundance in the North Pacific (Forney et al. 2000).

Hawaiian Monk Seal

The Hawaiian monk seal (*Monachus schauinslandi*) is a tropical seal endemic to the Hawaiian Islands. Today, the entire population of Hawaiian monk seals is about 1,300 to 1,400 individuals and occurs mainly in the northwest Hawaiian Islands. The six major reproductive sites are French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll. Small populations at Necker Island and Nihoa Island are maintained by both reproduction and immigration, and an increasing number of seals are distributed throughout the main Hawaiian Islands, where they are also reproducing.

The Hawaiian monk seal is assumed to be well below its optimum sustainable population, and since 1985 the overall population has declined approximately 3 percent per year (Forney et al. 2000). The 2004 U.S. Pacific Marine Mammal Stock Assessment estimates that there are 1,304 monk seals in the Hawaiian Islands with at least 52 of those occurring in the main Hawaiian Islands (Carretta et al*.* 2004). Recent population declines are thought to be caused by male aggression, shark attack, entanglement in marine debris, loss of habitat, and decreased prey availability.

In 1976, the Hawaiian monk seal was listed as endangered under the ESA (NMFS 1998). Under the MMPA, Hawaiian monk seals are classified as “strategic stocks” and are considered “depleted,” Critical habitat has been designated under the ESA to include all beach areas, sand spits, and islets, including all beach vegetation to its deepest extent inland, and lagoon waters out to a depth of about 40 m in designated areas of use; the following areas of the Northern Hawaiian Islands are included:

- Kure Atoll
- Midway Islands, except Sand Island and its harbor
- Pearl and Hermes Reef
- Lisianski Island
- Laysan Island
- Maro Reef
- Gardner Pinnacles
- French Frigate Shoals
- Necker Island
- Nihoa Island

In June 2011, NMFS proposed to revise critical habitat for the Hawaiian monk seal.

3.7.5 Potential Impacts of Cable System Implementation

General Description of Impact Types

Impacts associated with the construction and deployment of cables include direct destruction of seafloor habitat by the trenching required to bury the cable, direct burial of organisms from side-casted or trenched sediment, and associated generation of sediment plumes that would be transported to adjacent locations and that could result in additional burial or clogging of the feeding or respiratory organs of benthic or pelagic organisms. Noise generated by the cable-laying process and the ships themselves could harm or otherwise disorient any number of marine mammals, turtles, or fish. In the event the route selected includes UXO on the seafloor, these hazards would need to be safely removed prior to cable installation. Postconstruction impacts of the cable itself could include thermal or nearfield EMF effects on benthic and nektic organisms.

These topics and other potential impacts of the construction and operation of seafloor cables have been reviewed and discussed by OSPAR (2008, 2009).

Direct Seafloor Disturbance, Potential Destruction of Habitats

During construction, the cable would most likely be buried in order to minimize the risk of damage from anchors and fishing activities as well as to isolate the cable to minimize EMF and thermal impacts. Thus, during installation, the cable would be laid into a trench that would be excavated to a depth of at least 1–3 m depending on the hardness and nature of the substrate.

The degree of disturbance would depend on the type of habitat being traversed, hardness of the substrate, and water depth. If the substrate cannot be trenched, then it may be necessary to protect the cable by covering it partially or entirely with rocks or a rock-mattress.

In cases where the cable would be laid or jetted into a trench, the sediment that is removed would directly bury or otherwise destroy the sessile tube-dwelling or burrowing benthic organisms within the area being disturbed. Mobile organisms such as crustaceans will likely be able to escape the trenching process. The sediment being removed will naturally resettle and bury additional areas of the seafloor resulting in further mortality or disturbance to benthic organisms.

When benthic organisms are buried by redeposited sediment and are unable to move away, they may be able to burrow out depending on their size and mobility (see below).

Avoidance of sensitive habitats. Several potential reef habitats have been identified as part of the project. Such sites may have deep-water gorgonian corals and associated fauna encompassing a habitat specifically identified by BOEM for avoidance as part of their oil and gas management plans (MMS 2009a–b). Although BOEM has not developed similar documents for alternative energy, these sensitive habitats are identified in the PEIS for alternative energy development (MMS 2007). Attempting to lay a cable through such a habitat would irreversibly damage a faunal assemblage that may take decades to develop. Such areas must be avoided. Further surveys of these potentially sensitive habitats must be undertaken in order to finalize route selection. Types of habitats identified by BOEM as in MMS (2009a) may include:

- Areas of moderate to high relief that provide habitat for hard-bottom communities of high biomass and diversity and large numbers of plant and animal species, and that support, either as shelter or food, large numbers of commercially and recreationally important fishes. These are sometimes called *Lophelia* communities after the dominant coral genus.
- Isolated, low to moderate relief carbonate reef features or outcrops of unknown origin or hard substrates exposed by erosion that provide surface area for the growth of sessile invertebrates and attract large numbers of fish.

- Live bottoms (low relief features include seagrass communities, areas that contain biological assemblages consisting of sessile invertebrates living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; and areas where a hard substrate and vertical relief may favor the accumulation of turtles, fishes, or other fauna).
- Potentially sensitive biological features, including those features not protected by a biological lease stipulation and that are of moderate to high relief (about 8 feet or higher), provide surface area for the growth of sessile invertebrates, and attract large numbers of fish.

The nearshore coral reefs and deep-water coral communities identified as part of this document (Sections 3.7 and 3.14) fall into the type of sensitive habitats identified by BOEM.

More relevant are the following deep-water sensitive communities identified by BOEM in MMS (2009b):

- ***Deepwater chemosynthetic communities*** include assemblages of tubeworms, clams, mussels, bacterial mats, and a variety of associated organisms. They are remarkable in that they use a carbon source independent of photosynthesis and the sun-dependent photosynthetic food chain that supports most other life on earth. Many of the species, while similar to those of other chemosynthetic communities, including vent communities of the Galapagos Ridge, are new to science. The necessary conditions for their growth exist only in relatively small, widely scattered habitats. Where favorable conditions do occur, dense chemosynthetic communities can develop. Features or areas that could support chemosynthetic communities include hydrocarbon-charged sediments associated with surface faulting, acoustic void zones associated with surface faulting, anomalous mounds or knolls, and gas or oil seeps.

Chemosynthetic communities have not been identified in the areas of the Hawaiian Islands thus far investigated.

- ***Deepwater coral communities*** are now known to occur at locations in the deepwater areas in many parts of the world. These communities occur almost exclusively on authigenic carbonates created by chemosynthetic communities. Common species in the Gulf of Mexico where BOEM first protected these faunal assemblages include scleractinian corals such as *Lophelia pertusa* and *Madrepora oculata*, gorgonians such as *Callogorgia americana delta*, antipatharians, sponges, anemones, and various crustaceans. *Lophelia* has been found in water depths as shallow as 309 m (1,014 feet) in the Gulf of Mexico and have been reported in water depths up to 3,000 m (9,842 feet) in some parts of the world. Deep coral colonization can be on scattered small solitary features or spread over larger areas. These complex communities form three-dimensional structures that create habitat for hot-spots of biodiversity.

Deep-water coral communities do occur in the areas investigated as part of this study and would require more extensive documentation prior to cable deployment. In general, BOEM has defined a 500-foot exclusion zone in and around any deep-water coral communities that are identified.

Impacts of sediment burial on surface dwelling megafaunal organisms. The larger megafaunal organisms typically seen in the seafloor video along the interisland marine surveyed areas include large holothurians (sea cucumbers), echinoids (sea urchins), ophiuroids (brittlestars), anemones, sea pens, crabs, shrimps, and various types of demersal fish. The more mobile species of crabs, shrimps, and fish should be able to move away and avoid the trenching process and commensurate sedimentation. The less mobile holothurians, echinoids, and ophiuroids may also escape if the sediment depths are minimal. The sessile sea pens and anemones would likely be buried and perish.

Sediment burial and survival of benthic infaunal organisms. Direct burial of benthic infaunal organisms would have a range of impacts on the resident fauna depending upon their size and morphology. Some will simply be smothered and die *in situ*; others will have varying abilities to burrow out of the sediment and escape. Infauna typically includes a wide variety of polychaete worms, bivalve mollusks, crustaceans, echinoderms, and several lesser known fauna. These organisms compose a complex faunal assemblage of deposit feeders, suspension feeders, and predators. Like the megafauna, more mobile species will be more capable of burrowing out of the overlying sediment than sessile species. Benthic infauna was not sampled by SOEST as part of their route surveys and no data are available relative to benthic infaunal communities anywhere along the proposed cable corridors. However, the general composition of shallow- and deep-water benthic communities are well known, and several of the main types of organisms have been the subject of experimental work to determine response to sediment burial.

There is a relatively large body of literature on the impacts of sediment placement on benthic organisms. The vertical migration of infaunal organisms following sediment placement has been investigated both in the field (Nichols et al. 1978; Turk and Risk 1981; Wilber et al. 2007) and more extensively in laboratory experiments (Shulenberger 1970; Kranz 1976; Maurer et al. 1981a–b, 1982, 1986; Chandrasekara and Frid 1998; Roberts et al. 1998; Hinchey et al. 2006; Bolam 2011). Most of these studies have explored potential impacts of dredged material disposal on benthic infaunal survival in relation to depth of the sediment overburden on different types of organisms. From these investigations, several generalities are evident:

- Vertical migration and survival of benthic organisms differs widely based on size, morphology, and mode of life.
- Survival is directly linked to the depth of disposal and sediment overburden.

Bivalve mollusks appear to have the best overall capability of escaping from burial by deposited sediments (Maurer et al. 1986). Shulenberger (1970) buried large numbers of the small clam, *Gemma gemma*, under sand and silt and then traced their movements with X-radiography. The clams were able to cope with burial by less than 23 cm of sand and 5.7 cm of silt. As the sediment depths increased, the clams began to burrow vertically. Kranz (1974) studied more than 25 species of bivalves and found that survival was directly proportional to the size of the clams and their position in the sediment.

Comparative studies of sediment deposition on mollusks, crustaceans, and polychaetes were performed by Hinchey et al (2006). Their clams (*Macoma balthica*) achieved nearly 100 percent survival in all experiments, whereas the amphipod crustacean (*Leptocheirus plumulosus*) and the polychaete (*Streblospio benedicti*) exhibited exponential declines in survival with increasing sediment overburden, with *S. benedicti* having a much steeper decline.

These results and others suggest that survival of a benthic infaunal community after sediment burial during the trenching process would be highly variable, with some species escaping entirely and others exhibiting partial to complete mortality depending on their size, nature of the sediment, and depth of sediment deposition.

<u>Sediment Plumes and Transport during Construction</u>

The process of trenching and excavating sediment for cable laying would most likely create sediment plumes consisting of the fine-grained silt and clay fractions of the sediment. The higher the silt and clay fractions, the greater the likelihood of sediment plumes. The transport of these plumes away from the excavation site is dependent on the speed and direction of seafloor currents.

Sediments carried into suspension will settle out in a pattern that depends on current speed and direction and grain size of the suspended particles. Larger particles will settle out immediately, others will settle out over longer distances, with the depth of deposition likely being deeper closer to the site of trenching, then becoming thinner with increasing distance. The settlement of these particles will affect the benthic communities the same as direct burial described above. Fine particles could potentially be carried for great distances depending on local circulation patterns.

An additional concern with suspended sediment plumes is that the particles could affect the feeding apparatus of sensitive filter feeding organisms such as deep-water corals found in areas adjacent to the cable installation.

<u>Recolonization or Recovery of Disturbed or Newly Deposited Sediments</u>

Following a burial of benthic organisms by anthropogenic sediment, many would escape by rapid movement, others would be buried but able to burrow out and escape, others would be smothered and perish. Those that do escape will form the basis of reestablishing the original benthic community. However, the larger diversity of smaller benthic infauna would likely have perished. Therefore, the reestablishment of benthic organisms and the entire community will require time to recolonize the newly deposited sediment.

Colonizing benthic organisms can only come from two sources: settling larval forms produced by adults in adjacent undisturbed sediments, and movement of adults from adjacent sediments to the newly disturbed locations. Blake et al. (2009) suggested that the latter process is exactly what happens at a deep-water disposal site offshore northern California. Following disposal of deep deposits of dredged material at the SF-DODS disposal site offshore San Francisco, the benthic communities in the most disturbed sites were found to consist of the same assemblage of organisms as found in adjacent undisturbed or only weakly disturbed sites. Blake et al. (2009) suggested that benthic organisms from the adjacent sediment simply moved to the newly disturbed sites. The composition of the fauna suggested that this was case. Further, the presence of turbidity flows on the slope suggested that the fauna might have been preadapted to natural disturbance.

In Hawaiian waters, it is also likely that recolonization of disturbed or relocated sediments would be rapid if colonized by recruits from adjacent undisturbed sites. Unfortunately, no assessment has been made of the benthic infauna (or macrofauna) at any site proposed as a cable route and discussed in this review.

Noise

Potential noise impacts associated with subsea cables would occur during the construction phase and in connection with maintenance or repair. The construction activities considered include removal of the existing support structures and cables, installation of new support structures and cables, and trenching and backfilling. Noise impact may also arise from operation of vessels or machinery. The primary source of underwater noise during the removal and installation operations is expected to be the cable-laying ship. Shallow water workboats are also expected to generate a limited amount of noise during the shore pull operations. Underwater noise generated by the construction vessels used for cable laying would be similar to that of other ships and boats already operating in these areas.

Both the perception and effect of anthropogenic sound emissions vary depending on the hearing ability of a species. Marine mammals are most sensitive to high frequency noise. Sufficiently high levels of sound are likely to cause an avoidance reaction in many species.

The Office of Naval Research (2000) investigated the potential increases in ambient noise due to the placement of a small low-frequency sound source, including the installation and removal of a power cable. Humpback whales near Kauai had a minimal chance for disturbance of a biologically important behavior (percentage of 0.01 of the population at 120–180 decibels (dB) with a transmission duration of 1 day; there were no temporary threshold shift effects) (OSPAR 2008).

Although there are no clear indications that underwater noise caused by the installation or operation of subsea cables poses a high risk of harming marine fauna, significant gaps still exist in knowledge regarding both the characteristics of sound emissions and sound perception by marine animals. The Marine Mammal Commission is currently assessing the acoustic impact of underwater sound on marine mammals.

Scheduling laying activities and/or performing aerial surveys for monitoring the presence of, for example, marine mammals with a subsequent suspension of activities are possible mitigation measures.

EMF

Among invertebrates, spiny lobsters undergo seasonal migrations that have been shown to be influenced to the earth's magnetic field. This use of magnetic fields is apparently used for navigation and homing. Spiny lobsters live exclusively on the seafloor and would be exposed to the highest magnetic field strength of any power cable encountered. Sensitivity thresholds have not been determined, but a magnetic field emitted by a 60 Hz AC cable would have to be at least 5 μT to be detectable by the spiny lobsters' magnetite-based system, a field strength likely to occur only within several meters of the cable, but within perhaps tens of meters of a DC cable (Normandeau et al. 2011). Exposure to a DC cable could potentially delay or alter migration patterns or interfere with homing capabilities. Spiny lobsters were not encountered as part of the present study, but they may be resident in areas not surveyed by SOEST. Other crustaceans have not been investigated and research on other invertebrates regarding EMF effects is minimal and usually limited to laboratory experimentation.

Elasmobranchs can detect both electric and magnetic fields and as such are among the fish that appear to be the most affected by EMF. Normandeau et al. (2011) has provided an extensive review of the biology and physiology of elasmobranchs as it relates to EMF.

For marine mammals and turtles, magnetic or electric senses have been reported for several species. Life functions supported by a magnetic sense may include orientation, homing, and navigation to assist with long- or short-range migrations or movements. Life functions supported by an electric sense may include the detection of prey, predators, or conspecifics to assist with feeding, predator avoidance, and social or reproductive behaviors. A risk of interfering with these functions exists in areas surrounding cables where sensory capabilities overlap with cable EMF levels detectable by the organism (Normandeau et al. 2011).

Many marine mammals use magnetic cues for navigation, and magnetic fields generated by cables might impair their orientation and therefore negatively affect migratory behavior. Studies have indicated that a disturbance of the local geomagnetic field has caused stranding of whales in the U.S. and the United Kingdom. Additional evidence indicates that marine mammals are capable of detecting variations in the geomagnetic field, at the very least within a range of 30–60 nT and probably at much finer levels of discrimination (OSPAR 2008).

Bottlenose dolphins, which are known to be sensitive to the geomagnetic field, and undergo seasonal north-south migration, were selected for evaluation. In the western Atlantic, live strandings of this species have been correlated with geomagnetic minima, apparently responding to variations as low as <0.05 μT. Results indicate that cables carrying DC current would have the greatest potential for affecting this species and modeling suggests that the bottlenose dolphin could detect the field emitted by a DC cable (assuming cable field not influenced by the geomagnetic field) up to 50 m or more directly above the cable. The actual field intensity would, however, be affected by the orientation of the cable to the geomagnetic field. Based on these results, it is possible that a dolphin could sense the cable's magnetic field and alter the direction of its movement in response. Once outside the influence of the cable, which would be within a matter of meters, it would be likely to correct its orientation. Other dolphins and porpoises might be expected to have similar responses. Marine mammals have a relatively low likelihood of being affected by power cable EMFs despite being magneto-sensitive because their high mobility would limit the duration of exposure (Normandeau et al. 2011).

The geomagnetic sense in loggerhead turtles has been studied rather extensively and is important to its long-distance movements. There is evidence that the geomagnetic sense is critical for primary orientation to approach the general vicinity of a destination (e.g., nesting beaches, feeding grounds), but that fine-tuning is accomplished by using olfactory and visual cues. Hatchlings exposed to low-intensity pulsed magnetic fields swam randomly compared to control animals that swam easterly. Power cables placed in the immediate vicinity of nesting beaches could affect the ability of hatchlings to swim toward nursery grounds. It is assumed that similar impacts could be experienced by other sea turtle species. The severity of exposure of sea turtles at a critical life stage, such as adults and hatchlings traversing shallow waters at natal beaches, is high, although the likelihood of exposure is likely low, assuming careful siting (Normandeau et al. 2011).

3.7.6 General Siting Criteria and CCMs

General Description of CCM Recommendations

During cable-laying activities, the lay barge or cable ship would be required to employ observers to watch for marine mammal and turtles. These observers would be required to have training and certification from NMFS. A Marine Mammal Observer (MMO) Plan must be developed and approved. The MMO Plan would provide all protocols that must be followed if marine mammals or turtles are encountered.

Sensitive deep-water coral communities must be identified before construction so that they can be avoided. This would require additional and more detailed studies of the preferred routes. In review of the SOEST videos, numerous areas were observed that are believed to have well-developed live bottoms and these must be investigated with improved visual methods. Avoidance of sensitive habitats is a primary objective of CCM.

SOEST has already identified the hazards associated with considerable UXO offshore Pearl Harbor (Taylor 2010a–b) and was unable to recommend a safe route through these seafloor objects. In the event a Pearl Harbor landing site area is considered further, a plan to remove or otherwise displace these objects, which appear to include unexploded chemical bombs, must be developed.

The actual construction process of laying cable must proceed in a manner as to minimize or otherwise avoid damage to sensitive marine habitats known to be in the vicinity. This would be especially relevant where the cable would be buried. The trenching and side casting of sediment would not only excavate a trench and remove sediment, but would also displace any benthic organisms in the line of trenching. The side-casted sediment would in turn be deposited on adjacent sediment, therefore possibly burying or displacing other benthic organisms. At the same time, sediment plumes might be generated that would possibly drift and impact more sensitive organisms. Therefore, a careful evaluation of the final cable routes must include detailed investigations of the types of benthic communities along the route and the nature of the soft sediments. It is likely that most benthic infaunal communities are so widely distributed that the sediment being displaced by the cable burial is insignificant relative to the size of the area being transited. However, data need to be developed before a conclusive statement can be made.

Location-Specific Description of CCM Recommendations

<u>Federal Waters</u>

BOEM jurisdiction

BOEM has jurisdiction in federal waters to grant ROW for the cable except in federally mandated Marine Sanctuaries or Protected areas where NOAA has jurisdiction.

BOEM will have oversight in ensuring that cable laying and/or burial would not directly impact sensitive marine habitats or indirectly impact sensitive marine habitats through creation and transport of sediment plumes that potentially impact sensitive marine organisms. Other aspects of construction, including the use of anchors, anchor chains, or wire ropes that are part of the cable-laying operation, would also need to be considered.

BOEM can impose restrictions on the proposed cable route relative to proximity to sensitive biological habitats. For example, similar restrictions for oil and gas activities in the Gulf of Mexico included defined exclusion zones of 500 feet around sensitive deep-water coral communities (BOEM 2009b). It is likely that BOEM will require that detailed topographic and habitat maps be developed to ensure that sensitive habitats are identified and avoided.

NOAA jurisdiction

The following regulations are in place to protect humpback whales in the HIHWNMS and also apply anywhere within Hawaiian waters per the ESA. Enforcement of these regulations is coordinated by the NOAA OLE with the USCG, DOCARE, and the NOAA Office of General Counsel.

Prohibited activities include (1) approaching, or causing a vessel or other object to approach, within the HIHWNMS, by any means, within 100 yards of any humpback whale except as authorized under the MMPA, as amended, and the ESA, as amended; and (2) operating any aircraft about the sanctuary within 1,000 feet of any humpback whale except when in any designated flight corridor for takeoff or landing from an airport or runway or as authorized under the MMPA and the ESA.

The following recommendations should also be considered:

- Operators are advised to post at least one dedicated whale lookout, in addition to the operator, from November through May. However, NOAA may advise to schedule construction only during June through October to avoid possible conflicts with whale populations.
- NOAA recommends that vessels travel at a slow, safe speed in areas where a whale strike may occur. This speed depends on vessel type, time of day, sea conditions, and other factors that affect whale detection and avoidance. Research shows that collisions occurring at vessel speeds above 10 knots cause more whale deaths and serious injuries than collisions occurring at slower speeds.
- Once whales are sighted, stay more than 100 yards away.
- Stop immediately if within 100 yards or less of a humpback whale. Leave engines running, out of gear (in neutral) until the whale moves away.
- Go around whales from behind, while maintaining more than a 100-yard distance, if a whale is encountered in path of vessel. Do not attempt to run out in front of whales to get past them.

Data Gap Recommendations for Final Route Selection

As part of the SOEST video review, numerous data gaps have been identified. Most of the more obvious gaps include the apparent location of sensitive habitats that are inferred but not confirmed due to the low quality of many of the TowCam images. Final route selection will depend on higher quality imaging once preferred routes have been identified.

Other less obvious data gaps relate to interpretation of gouges or troughs on the seafloor that might represent evidence of feeding by beaked whales. A recent paper by Auster and Watling (2010) documents gouges on the seafloor that denoted possible beaked whale foraging areas off the northeast U.S. Dr. Les Watling (personal communication, June 12, 2010) noted that similar marks were observed on Penguin Bank as part of surveys by the Hawai‘i Underwater Research Laboratory (HURL). Given the shallow nature of these marks, Dr. Watling suggests that these could also be from dolphins or monk seals. Narrow troughs were observed on the seafloor in several locations as part the analysis of the SOEST videos. Several observations, however, were in depths of >500 m, suggesting that if these troughs are from marine mammals, then they would be from beaked whales rather than dolphins or seals.

Detailed Sediment Evaluation to the Dredging Depth

To date, no detailed sedimentary data have been collected from any portion of the SOEST route, including information on sedimentology, geochemistry, and benthic biology. In areas where the cable would be buried, grain-size data will help determine the likelihood of sediment plumes being created. Benthic biology data will determine what kinds of benthic organisms would be impacted by trenching and associated direct or indirect burial. To date, the only benthic organisms that have been documented are megafauna, the larger organisms that are readily observed in SOEST video images. The benthic infauna or macrofauna have not been sampled. These organisms are the main food supply for demersal fish.

Seafloor Current Evaluation

To understand hazards on the seafloor, as well as potential of sediment transport via plumes, understanding of the seafloor and water column currents is required. The observation of drifting algae in some locations and some seafloor scouring suggest variable current velocities along the different routes that are being explored. Moored Acoustic Doppler Current Profiler (ADCP) systems and/or boat-based ADCPs need to be deployed to gather data on current velocity and direction.

Sediment Transport Modeling to Evaluate Potential Plume Impacts

Once sedimentology and current direction and velocity are determined, sediment transport models should be developed to understand the size and potential movement of sediment plumes during construction.

Table 3.7-1. Organisms Identified from the SOEST ROV Video Taken along Transects in Hawaiian Waters

	R440	R441	R442	R444	R443	R445	R446	R447	R448	R449
PORIFERA										
sponge	x	x	x					x	x	x
sponge - white, stalked		x								
Sericolophus hawaiicus		x		x						
Sericolophus sp.							x			
CNIDARIA										
anemone	x				x			x		x
gray cerianthid (burrowing) anemone		x		x			x			
hormathiid (stalked anemone)	x	x		x						x
tubulariid hydroids			x	x						x
hydrozoan			x							
Callogorgia gilberti		x		x						
Callogorgia sp.				x						
coral					x	x ?			x	
coral - bamboo		x								
coral - black		x	x ?					x		
coral - cup										x
coral - fan		x								
coral - gorgonian										x
coral - soft red		x								
coral - stalked		x		x						
sea fan										
Hallipterus willimoesi	x	x					x			
Kophobelemnon stelliferum	x		x	x						
sea pen	x			x	x		x	x	x	
CTENOPHORA										
Lyrocteis sp.						x		x		
CRUSTACEA										
barnacles						x ?				
crab					x					
crab - small, long-arms; squat lobster								x		
crab - small, short arms								x		
Cyrtomaia smithi (spider crab)	x	x		x						
lobster					x					
shrimp	x	x		x	x		x			x
Plesionika sp.			x							
MOLLUSCA										
octopus								x		
bivalves (brown exterior, white interior)								x		
sea slug			x		x					
squid (juvenile)			x				x			
ANNELIDA										
sabellid polychaete		x								
polychaete tubes					x					
ECHINODERMATA										
echinoderm										
crinoid		x						x		
Phormosoma bursarium	x	x		x						
Brisinga fragilis	x									
Brisinga sp.	x	x		x						x
Calodermis spectabilis								x	x	

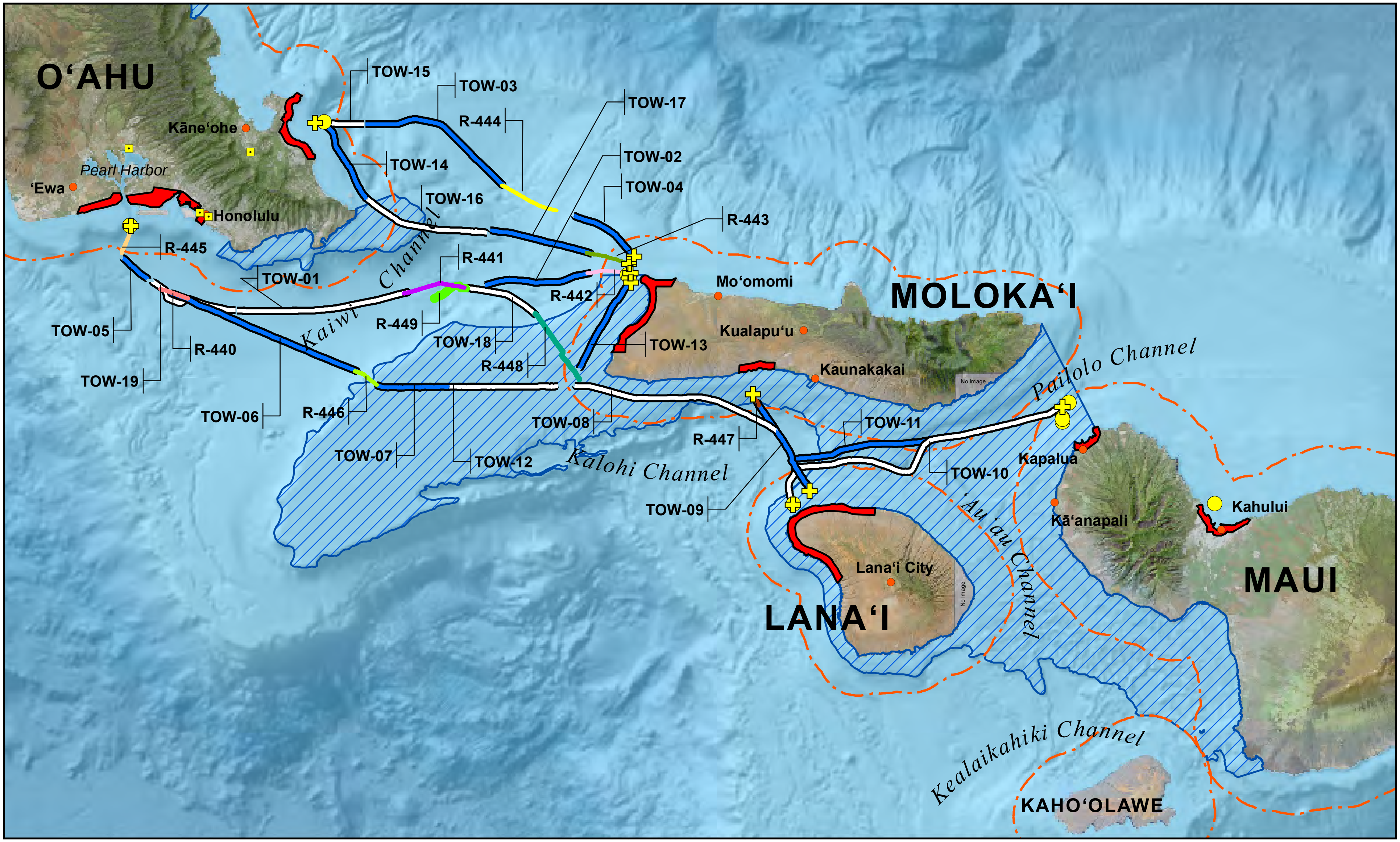
	R440	R441	R442	R444	R443	R445	R446	R447	R448	R449
Calodermis sp.			x							
maroon sea star					x					
basket star		x								
brittle star		x		x						x
starfish (sea star)		x		x	x			x	x	
Paleopatides retifer		x								
holothurians (sea cucumber)		x		x	x		x	x		
Aspidodiadema hawaiiensis (urchin)	x			x						
urchin	x	x	x	x	x			x	x	x
TUNICATA										
colonial salp							x			
FISH										
Acanthurus blochii (ringtail surgeonfish)									x	
Acanthurus dussumieri (whitespine surgeonfish)									x	
Antigonia sp.			x					x		
box fish			x		x					
Canthigaster coronatus			x							
Carcharinus pufeus (*sandbar shark*)								x		
Centrocyllium nigrum (dogfish shark)		x		x	x		x			
Coelorhynchus sp. (rat-tail fish)	x									
Cookeolus japonicus (fish)						x				
eel	x	x		x	x				x	x
fish					x	x		x		x
fish - butterfly type							x			
fish - lizard fish								x		
fish - small, silver									x	
flat fish					x			x	x	
Glossanodon sp.			x				x		x	
Kahala jack fish						x				
long-finned bullseye fish						x				
macrurid fish				x						
Pontinus macrocephalus							x			
puffer fish								x	x	
rat-tail fish		x		x						
red frilly scorpion-type fish					x					
scorpionfish			x					x		
Setarches (*scorpionfish*)		x								
Sphoeroides pachygaster			x							
stingray (ray)	x									
Ventrifossa sp. (rat-tail fish)	x									
white/black reef fish					x					
Plants										
Ulva sp.									x	
algae							x		x	

Table 3.7-2. Non-ESA-Listed Marine Mammals Known to Occur around Hawai'i

Common Name	Scientific Name
Blainsville's beaked whale or Dense-beaked whale	*Mesoplodon densirostris*
Bottlenose dolphin	*Tursiops truncatus*
Bryde's whale	*Balaenoptera edeni*
False killer whale	*Pseudorca crassidens*
Melon-headed whale	*Peponocephala electra*
Pygmy killer whale	*Feresa attenuata*
Pygmy sperm whale	*Koiga breviceps*
Risso's dolphin	*Grampus griseus*
Rough-toothed dolphin	*Steno bredanensis*
Short-finned pilot whale	*Globicephala macrorhynchus*
Spinner dolphin	*Stenella longirostris*
Spotted dolphin	*Stenella attenuata*
Striped dolphin	*Stenella coeruleoalba*
Minke whale	*Balaenoptera acutorostrata*
Killer whale	*Orcinus orca*
Pilot whale	*Globicephala macrorhynchus*
Pacific bottlenose dolphin	*Tursiops gilli*

Table 3.7-3. ESA-Listed Marine Mammals Known to Occur around Hawai'i.

Common Name	Scientific Name	Status: E, Endangered T, threatened
Sea Turtles		
Olive ridley sea turtle	*Lepidochelys olivacea*	T
Loggerhead turtle	*Caretta caretta*	T
Green sea turtle	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	E
Hawksbill turtle	*Eretmochelys imbricata*	E
Mammals		
Humpback whale	*Megaptera novaeangliae*	E
Sperm whale	*Physeter macrocephalus*	E
Blue whale	*Balaenoptera musculus*	E
Fin whale	*B. physalus*	E
Sei whale	*B. borealis*	E
Hawaiian monk seal	*Monachus schauinslandi*	E



UH-SOEST ROV and Tow Camera Routes

- Route with camera data *
- Route without camera data **
- Identified O‘ahu Substation Locations
- Selected Cities & Communities
- HIREP Study Analysis Area
- State Jurisdictional Waters (3 nautical miles)
- Humpback Whale National Marine Sanctuary
- Open Water

UH-SOEST Tow Camera Route Segments

- Tow Camera Segment
- Alternating Tow Camera Segment

UH-SOEST ROV Route Segments

- R-440
- R-441
- R-442
- R-443
- R-444
- R-445
- R-446
- R-447
- R-448
- R-449

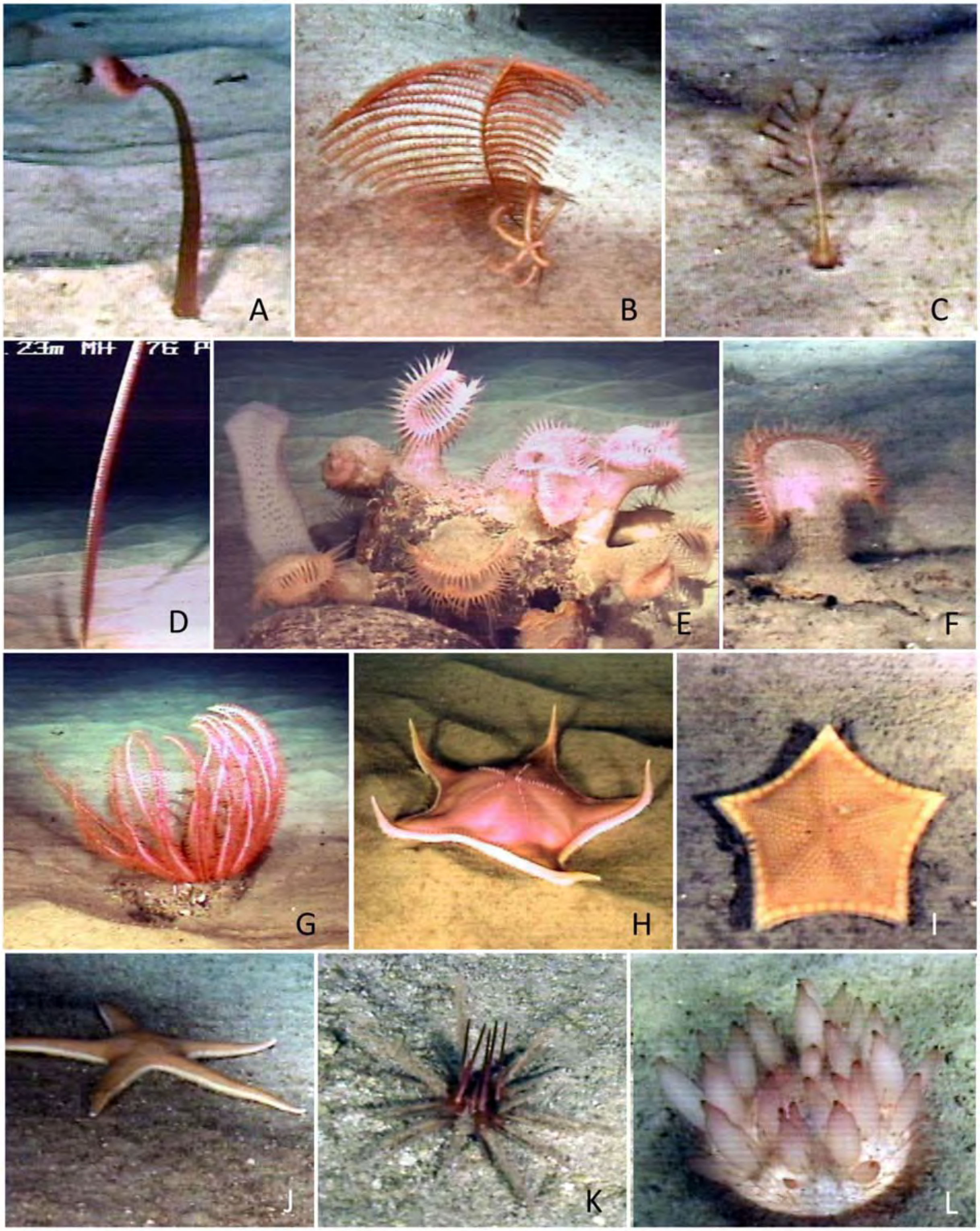
N

0 5 10 Miles

* Symbol denotes shoreward extent of tow camera data for cable route (unless otherwise noted).
** Symbol denotes shoreward approach of cable route without tow camera data.

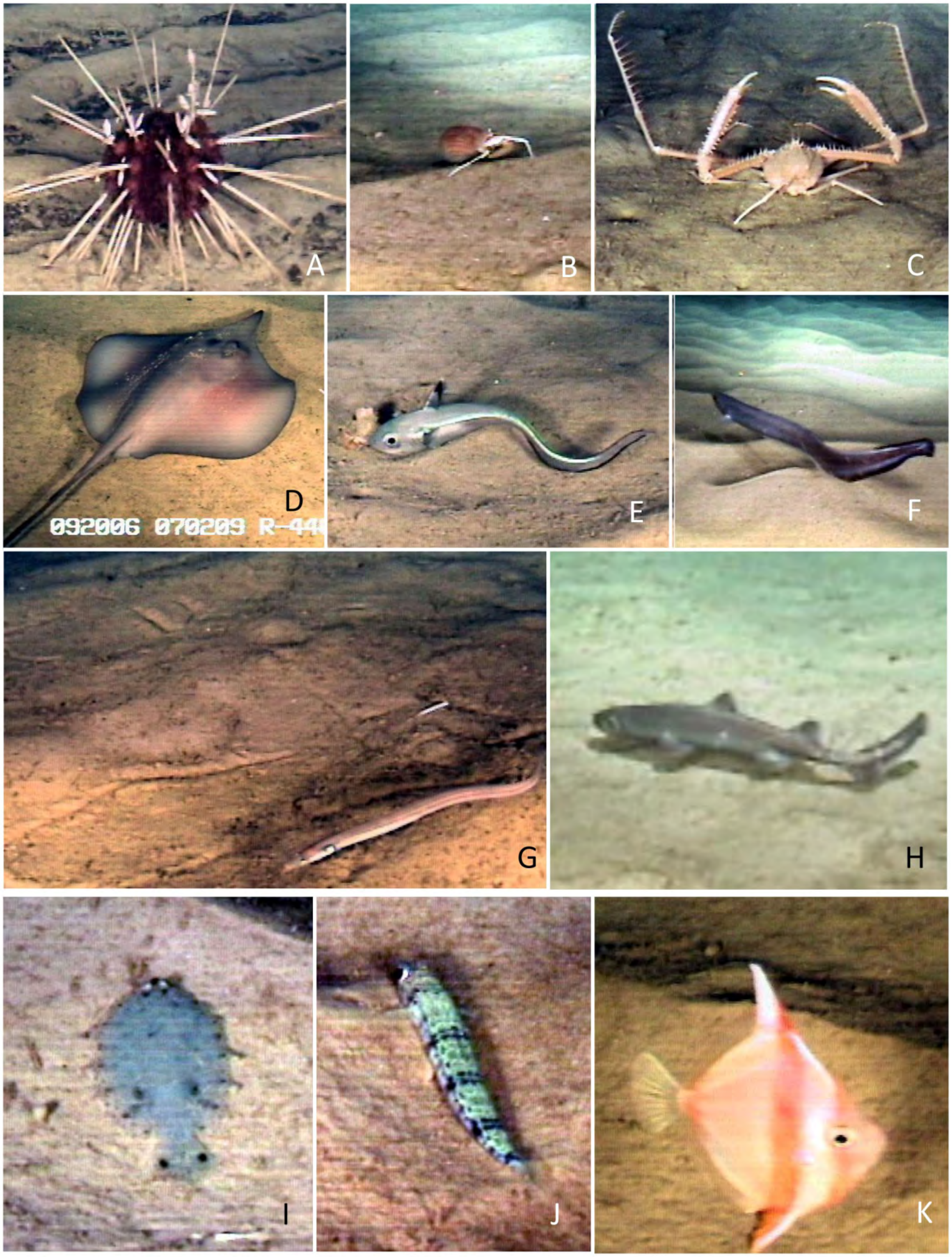
Date: 4/26/2012
Data Sources: HI-DBEDT,NOAA, UH-SOEST, AECOM, 2012

Figure 3.7-1



A, Soft coral; B, Sea pen; C, Soft coral, *Kophobelemnon stelliferum;* D, Sea pen, *Halipterus willimoesi;* E, Siliceous sponge (left) and fly-trap anemones; F, Anemone; G, Brisingid starfish; H, Starfish, *Calliderma emma*; I, Bat starfish; J, Starfish; K, Sea urchin, *Aspidodiadema hawaiiense*; L, Sea urchin, *Phormosoma busarium.*

Figure 3.7-2. Collage of Images of Some Benthic Invertebrates Encountered during Review of the SOEST ROV Videos



A, Sea Urchin, *Histocidaris variabilis*; B, Hermit crab; C, Spider crab, *Cyrtomaia smithi*; D, Ray; E, Rat tail fish, *Coelorinchus* sp.; F, Eel; G Eel and burrow marks on the seafloor; H, Pacific Black Dogfish Shark, *Centrocyllium nigrum*; I, Flatfish (flounder); J, Reef fish; K, Boarfish, *Antigonia* sp.

Figure 3.7-3. Collage of Images of Benthic Invertebrates and Fish Encountered during Review of the SOEST ROV Videos

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