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HAWAII

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JUL 23 2019

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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF: OCCL: SH

MEMORANDUM

TO: Scott Glenn, Director
Office of Environmental Quality Control

FROM: Suzanne D. Case, Chairperson
Department of Land and Natural Resources

SUBJECT: **DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR THE STATEWIDE SMALL SCALE BEACH RESTORATION PROGRAM**

The Department of Land and Natural Resources has reviewed the Draft Programmatic Environmental Assessment (DEA) and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for this project in the **July 23, 2019** issue of the *Environmental Notice*. We have enclosed the applicant's OEQC Bulletin publication form, a CD with a copy of the DEA and Publication Form and a hardcopy of the DEA.

Should you wish to provide comments regarding this project **please respond by August 23, 2019**. If no response is received by the suspense date, we will assume there are no comments. Please contact Shellie Habel at the Office of Conservation and Coastal Lands at (808) 587-0049 should you have any questions.

Enclosures: *One (1) CD with a copy of DEA and Publication Form*
OEQC Bulletin Publication Form (hard copy)
DEA (Hard Copy)

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20-009

AGENCY
PUBLICATION FORM

Project Name:	Statewide Small Scale Beach Restoration Program
Project Short Name:	Statewide SSBR Program
HRS §343-5 Trigger(s):	(1) Propose use of state or county land, shoreline and waterways or the use of state or county funds; (2) Propose any use within any land classified as a conservation district by the State land use commission under HRS 205; (3) Propose any use within a shoreline area as definied in section 205A-41; and (4) Propose any use within any historic site as designated in the National Register or Hawaii Register, as provided for in the Historic Preservation Act of 1966, Public Law 89-665, or HRS Chapter 6E.
Island(s):	Statewide
Judicial District(s):	1st Circuit, 2nd Circuit, 3rd Circuit, and 4th Circuit
TMK(s):	Statewide
Permit(s)/Approval(s):	Various (see document)
Proposing/Determining Agency:	State of Hawaii Department of Land and Natural Resources
Contact Name, Email, Telephone, Address	Samnuel J. Lemmo, Administrator, Office of Conservation and Coastal Lands Kalanimoku Building 1151 Punchbowl St. Room 131 Honolulu, HI 96813 Telephone: (808) 587-0377 Email: sam.j.lemmo@hawaii.gov
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	APTIM
Contact Name, Email, Telephone, Address	Andrew J. Wycklendt, P.E. 1050 Queen Street, Suite 100 Honolulu, HI 96814 Telephone: (808) 783-6816 Email: andrew.wycklendt@aptim.com

Status (select one)	**Submittal Requirements**
_x_ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.

____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.
____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
____ FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____ Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____ Other	Contact the OEQC if your action is not one of the above items.

Project Summary

The Department of Land and Natural Resources (DLNR) wishes to re-authorize the Small Scale Beach Nourishment (SSBN) program and implement a streamlined and coordinated regulatory process among the DLNR, Office of Conservaton and Coastal Lands, State Historic Preservation Division, U.S. Army Corps of Engineers, State of Hawai'i Coastal Zone Mangement Office, and the Department of Health for small-scale beach restoration projects. As such, DLNR proposes to extend the SSBN program to create a Small Scale Beach Restoration (SSBR) program that not only offers beach nourishment as a viable ecosystem-based management option to address coastal erosion, but provides additional alternatives for managing beaches to conserve this limited resource.

The purpose of the SSBR program is to facilitate the implementation of coastal erosion control projects that result in ecosystem restoration and improved public beach access while maintaining Hawaii's visitor-based economy. The goal of the program is to enable SSBR projects to be implemented by private and government applicants through a cost-effective, timely, and environmentally-conscious permitting program. Beach restoration projects with properly planned and executed nourishment programs will assist in managing erosion threats to beachfront property and infrastructure, reduce impacts associated with climate change and sea level rise, and increase overall coastal resilience.

Draft Programmatic Environmental Assessment / Finding of No Significant Impact

Statewide Small Scale Beach Restoration Program

July 2019

Prepared for:
Department of Land and Natural Resources
http://dlnr.hawaii.gov

Prepared by:
APTIM
http://www.aptim.com

With the support of:
Honua Consulting
http://www.honuaconsulting.com

Project Name:
Draft Programmatic Environmental Assessment (DPEA) and Finding of No Significant Impact (FONSI) for Statewide Small Scale Beach Restoration (SSBR)

Island:
Main Hawaiian Islands (i.e. the Islands of Hawaiʻi, Maui, Molokaʻi, Lānaʻi, Oʻahu, and Kauaʻi)

Proposing/Determination Agency:
Office of Conservation and Coastal Lands
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Summary:
In an effort to mitigate coastal erosion hazards, restore degraded beach environments, reduce impacts associated with climate change and sea level rise, and increase coastal community resiliency, the Department of Land and Natural Resources (DLNR) wishes to re-authorize the Small Scale Beach Nourishment (SSBN) program and implement a streamlined and coordinated regulatory process, particularly among the DLNR, Office of Conservation and Coastal Lands (OCCL), State Historic Preservation Division (SHPD), U.S. Army Corps of Engineers (USACE), State of Hawaiʻi Coastal Zone Management Office (CZM), and the Department of Health (DOH), for small-scale beach restoration projects. As such, DLNR proposes to re-authorize and extend the SSBN program to create a Small Scale Beach Restoration (SSBR) program that not only offers beach nourishment as a viable ecosystem-based management option to address coastal erosion, but provides additional alternatives for managing beaches to conserve this limited resource.

The purpose of the SSBR program is to provide a streamlined permitting approach that will allow for the implementation of coastal erosion control projects that will result in ecosystem restoration and improved public beach access while maintaining Hawaii's visitor-based economy. Beach restoration projects with properly planned and executed nourishment programs will assist in managing erosion threats to beachfront property and infrastructure, reduce impacts associated with climate change and sea level rise, and increase overall coastal resilience. Properly designed beach restoration projects can have other benefits within the broader coastal environment such as ensuring the continued provision of habitat for various threatened and endangered species, protecting cultural sites and burials in the backshore, and improving water quality by providing a natural buffer between waves and exposed soil deposits and on-site sewage disposal systems along eroded shorelines. The goal of the program is to enable small-scale beach restoration projects to be implemented by private and government applicants through a cost-effective, timely, and environmentally-conscious permitting program.

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Definitions

The following are key terms used throughout and defined for the purposes of this environmental assessment.

Beach: A coastal landform composed of unconsolidated sediment, usually sand, that is established and shaped by wave action and tidal processes. Beach is further defined as a dynamic system encompassing submerged sediment deposits located in nearshore areas and sediment contained in dunes and/or older beach deposits located in the backshore area.

Beach Maintenance: Placement of beach compatible sediment to advance the shoreline seaward, generally in response to chronic beach erosion. Also known as Beach Restoration.

Beach Management: Redistribution of sediment within a littoral cell from an accreting area to an eroding area for the purpose of managing chronic, seasonal, and episodic erosion hazards. Such activities include the restoration of dunes, berms, and beach slopes through sand pushing, backpassing, and bypassing operations.

Beach Restoration: General term used to describe beach maintenance, beach management, and may include limited use of beach stabilization.

Beach Stabilization: The use of typically shore-perpendicular structures such as groins with beach restoration to slow the loss of sand. Beach stabilization may be considered when it is clearly demonstrated that it is appropriate for the existing littoral system (i.e., for the existing natural and/or engineered shoreline environment) and will avoid negative effects on the beach or marine environment.

Borrow Area: Area from which beach compatible sediment, usually sand, is removed for use in beach restoration activities. Borrow areas are generally located in marine (i.e. nearshore or offshore deposits) or onshore areas (i.e. inland dunes or coastal plains). The extent of a borrow area is generally defined by horizontal and vertical excavation limits that encompass the area in which beach compatible sediment has been identified.

Coastal Armoring: Use of shore-parallel structures such as seawalls, bulkheads, and revetments to harden the shoreline and stop local erosion. Coastal armoring structures trap sand from the littoral system and starve adjacent and downdrift beaches, often resulting in beach loss. Also known as shoreline armoring or shoreline hardening. This SSBR program is intended to provide a nature-based alternative to coastal armoring through beach restoration.

Littoral Cell: Coastal compartment that encompasses a complete cycle of sedimentation including sources, transport pathways, and sinks. Such cells are generally isolated sedimentologically from adjacent coastal reaches in which geologic features (i.e. protruding headlands, submarine canyons, inlets, river mouths, etc.) obstruct littoral transport from one cell to the next. Artificial terminal structures such as groins, jetties, and breakwaters, as well as dredged channels, can also separate littoral cells.

Sand Pushing: Moving sand typically through mechanical means to the dune or upper beach. Sand pushing typically involves moving sand from the lower to the upper beach to manage backshore erosion and run-up impacts, redistributed to rebuild dunes, berms, and beach slopes, and occasionally from behind the shoreline back to the active beach to mitigate loss of sand due to wave overwash.

Sand Backpassing: Moving sand within a littoral cell typically through mechanical means from an area of chronic or seasonal accretion (e.g. stream mouth) back to its source.

Sand Bypassing: Moving sand typically through mechanical means around an obstruction to artificially facilitate littoral sand migration.

Sand Recovery: Method in which sand is acquired from a borrow area. Many beach restoration projects employ dredge equipment such as pumps and excavation buckets to recover sandy material from borrow areas. As such, these “dredge projects”, as they are commonly referred, can also be termed “sand recovery” projects in cases when the sand is being recovered from a borrow area (i.e. a nearshore or offshore sediment sink) for the purpose of restoring a beach within the same littoral cell.

1 PURPOSE AND NEED FOR ACTION

The purpose of the Small Scale Beach Restoration (SSBR) program is to provide a streamlined permitting approach that will allow for the implementation of coastal erosion control projects that will result in ecosystem restoration and improved public beach access while maintaining Hawaii's visitor-based economy. Facilitating the implementation of beach restoration projects with properly planned and executed nourishment programs through a streamlined permitting process will provide a nature-based alternative for mitigating coastal erosion problems, increasing resiliency to high wave events and storms, and reducing vulnerability to increasing coastal flooding and erosion caused by climate change and sea level rise. In addition, restoration and maintenance of this recreationally and culturally significant region of the ahupuaʻa (Hawaiian term for the traditional socioeconomic, geologic, and climatic subdivision of land) can maintain and improve habitat for a wide range of species, improve water quality by providing a natural buffer between waves and exposed soil deposits along eroded shorelines, and can help preserve cultural resources in the backshore. The Department of Land and Natural Resources (DLNR) would like obtain a Regional General Permit from the U.S. Army Corps of Engineers (USACE) as well as enter into an Interagency Programmatic Agreement with the State Historic Preservation Division (SHPD), USACE, Hawaiʻi Coastal Zone Management Office (CZM), and Department of Health (DOH) to facilitate permit streamlining. This Programmatic Environmental Assessment (PEA) serves as the overarching environmental and cultural document to facilitate streamlining and coordinating of permit functions.

1.1 Hawaiʻi Beach Resource Overview

The loss of Hawaii's beaches is a major social, economic, and environmental problem. A 2012 study found that 70% of the beaches on Kauaʻi, Oʻahu, and Maui are chronically eroding (Fletcher et al., 2012). Climate change and sea level rise are increasing the extent and severity of erosion and loss of beach environments, particularly in Hawaiʻi where these impacts are amplified due to its microtidal environment, limited sand supply, and degrading nearshore reefs (DLNR, 2017). Historically, the typical response to beach erosion in Hawaiʻi has been to harden shorelines with seawalls and revetments to protect backshore investments from erosion damage and inundation. However, this legacy of widespread shoreline hardening has contributed to the narrowing and loss of chronically eroding beaches in Hawaiʻi (Romine and Fletcher, 2012; Fletcher et al., 1997; Hwang and Fletcher, 1992). Over 13 miles of Hawaiʻi beaches were completely lost to erosion over the past century, nearly all of which fronted coastal armoring (Fletcher et al., 2012). When beaches erode, upland development is threatened, shoreline access is lost, recreation and cultural activities are limited, coastal habitat is impacted, and our visitor economy suffers. The State of Hawaiʻi must continue to facilitate alternatives to coastal armoring for beach erosion management if our community wishes to conserve beaches for this generation and generations to follow.

1.1.1 Importance of Hawaiʻi Beaches

Hawaiʻi beaches are a critical natural and public resource as they mitigate coastal hazards, provide coastal habitat, protect the quality of state waters, stimulate the visitor economy, and improve shoreline access while facilitating recreational, spiritual, and cultural activities. Beaches provide a natural buffer to coastal hazards by reducing wave run-up and associated inundation. Beaches provide coastal habitat for monk seals, sea turtles, shorebirds, and a variety of other species. Beaches in a "healthy" state protect the quality of state waters by providing a natural defense between waves and exposed soil deposits and on-site sewage disposal systems in the backshore. Hawaii's world-class beaches are a key attraction for the State's visitor economy. Moreover, beaches improve shoreline access for recreational, spiritual, and cultural activities that connect us to the ocean and are critical components to the Hawaiian way of life and sense of place.

Under the public trust doctrine, the State of Hawaiʻi holds natural resources in trust for the public and is constitutionally bound to defend, preserve, protect, maintain, and perpetuate that resource (DLNR, 1999).

> *For the benefit of present and future generations, the State and its political subdivisions shall conserve and protect Hawaii's natural beauty and all resources … and shall promote the development and utilization of these resources in a manner consistent with their conservation and in furtherance of the self-sufficiency of the State.*
>
> Hawaiʻi State Constitution, Article XI Section 1

The Hawaiʻi State Planning Act (Act 286, HRS Section 226-109) encourages the preservation and restoration of natural landscape features, such as beaches and dunes, which have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change and sea level rise. In an effort to conserve beach resources for present and future generations, the Hawaiʻi Coastal Erosion Management Plan (COEMAP) was developed to address coastal erosion within a framework for beach protection. Major recommendations within the COEMAP promote beach nourishment and restoration as a viable alternative to shoreline armoring (DLNR, 1999). Considering shoreline armoring is either prohibited or heavily discouraged under the Hawaiʻi Coastal Zone Management Act (HRS Section 205A) due to its impact on beaches, the most recent version of the Hawaiʻi Ocean Resources Management Plan (ORMP), which provides a framework for ocean and coastal resource management in Hawaiʻi, emphasizes DLNR's role in (1) developing programs for beach nourishment, (2) streamlining the beach nourishment regulatory process, and (3) providing public-private partnerships for beach restoration (CZM, 2013). Management Priority #1 for Appropriate Coastal Development within the ORMP seeks to enhance natural infrastructure to build coastal resilience by implementing cost-effective beach nourishment through streamlined permitting.

The recently completed Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report (DLNR, 2017), developed through the Hawaiʻi Climate Mitigation and Adaptation Initiative (Act 32, Session Laws Hawaiʻi 2017; Chapter 225P, Hawaiʻi Revised Statutes), includes recommendations for planning, management, and adaptation to hazards associated with increasing sea level rise. This report states that beach nourishment could help extend the life of Hawaii's beaches. Recommendations within the report that relate to beaches are summarized below:

- Recommendation 1: Sustainable and Resilient Land Use and Community Development. Recommended Action 1.6 suggests developing shoreline protection [coastal erosion control projects], conservation, and restoration priorities and guidelines; many of the examples provided acknowledge the importance of beaches and promote beach restoration and nourishment.

- Recommendation 4: Enable Legacy Beaches to Persist with Sea Level Rise. This recommendation in its entirety acknowledges and details the importance of beaches. Recommended Actions focus on the need to enable beaches in Hawaiʻi to persist with sea level rise. Recommended Actions also consider funding for land acquisition and beach restoration activities through public-private sector partnerships as well as explore other alternative actions to help protect beaches.

In summary, beaches are an essential component of the ahupuaʻa that connect the land with the sea. Without beaches, we would lose this vital connection and the numerous benefits they provide.

1.1.2 Present Condition of Hawaiʻi Beaches

As stated above, studies of historical shoreline change using aerial photographs and survey maps show that 70% of the beaches on Kauaʻi, Oʻahu, and Maui are chronically eroding (Fletcher et al., 2012). Long-term shoreline change rates detailed in this USGS report are summarized in Table 1. Positive values in the table indicate shoreline advance (i.e. accretion) while negative values indicate shoreline retreat (i.e. erosion). These long-term shoreline change rates were calculated using available data between the early 1900s and 2008. Table 1 shows that shoreline change rates vary considerably, by both island and location around each island. This demonstrates the dynamic nature of Hawaii's beaches and why looking at just average shoreline change can be misleading, especially when evaluating the need to restore or manage beach resources.

Table 1. Long-Term Shoreline Change Rates

Location		Shoreline Change Rate (feet/year)		
Island	**Region**	**Average**	**Max Erosion**	**Max Accretion**
Kauaʻi	North	-0.4	-2.3	2.3
Kauaʻi	East	-0.5	-2.3	2.3
Kauaʻi	South	0.0	-4.9	4.6
Kauaʻi	West	-0.4	-4.6	5.2
Kauaʻi	Total	-0.4	-4.9	5.2
Oʻahu	North	-0.4	-4.3	2.6
Oʻahu	East	0.0	-5.9	4.9
Oʻahu	South	-0.1	-5.2	2.6
Oʻahu	West	-0.8	-3.9	5.6
Oʻahu	Total	-0.2	-5.9	5.6
Maui	North	-0.9	-4.9	4.9
Maui	Kihei	-0.4	-3.6	5.2
Maui	West	-0.5	-3.0	2.0
Maui	Total	-0.6	-4.9	5.2
Total	**Total**	**-0.4**	**-5.9**	**5.6**

The significant erosion and accretion variation shown in Table 1 can partially be attributed to Hawaii's headland and embayment dominated coastal geomorphology. Rocky headlands typically divide the coast into small sandy embayments. As observed in a study of northeast Oʻahu shoreline change, sand is typically transported from the headlands to the bay center, which results in erosion near the headlands and accretion within the embayment (Romine et al., 2016). Although this may not result in a net loss of sand within the littoral system, the chronic erosion at the headlands can lead to beach loss, especially when seawalls are present in the backshore. This scenario was observed at the Boat Ramp near Alāla Point during the Kailua Beach site visit (see Appendix A for additional details).

In addition to the long-term spatial erosion and accretion variation discussed above, Hawaiʻi beaches are also subject to shorter-term (i.e. seasonal) erosion and accretion cycles. Beaches subject to seasonal erosion typically recover the following season (e.g. winter erosion recovers during summer accretion) unless there is an underlying trend of chronic erosion. Many beaches in Hawaiʻi are exposed to seasonally dependent alternating predominant wave directions. On these beaches, one end (or segment) of the beach typically erodes while the other end of the beach accretes, with the process reversing the following season. This “beach rotation phenomenon” is different from beach oscillation, which occurs when the entire beach erodes during storm wave events and recovers during calm periods. The beaches of West Maui provide a good example of this seasonal variability. During the summer months, the predominant southerly waves generated by distant storms in the South Pacific transport beach sand from south to north. Conversely, during the winter months, large waves from the North Pacific dominate and beach sand is transported from north to south. If shoreline positions or beach surfaces are measured during the same time of year, data review may suggest that the beach is relatively stable, when in actuality the beach may be highly dynamic. Seasonal erosion along these dynamic beaches is amplified when there is an underlying trend of chronic shoreline retreat. For example, the problem of chronic shoreline retreat punctuated by seasonal beach erosion has been especially severe at Kahana in West Maui, where several multi-story condominium buildings are threatened by beach erosion during winter months. Although temporary erosion control structures built using heavy sand bags have been installed on a property-by-property basis to protect threatened investments, the beach in front of these structures has been largely lost. Kahana and many other similar examples show that Hawaiʻi beaches would benefit from a littoral cell based management approach, that is management focused on an entire beach system rather than individual properties, which is one of the SSBR program goals and has been recommended in numerous beach management plans (DLNR, 2010; County of Maui, 2008; DLNR, 1999; among others).

Storm and wave impacts are not just limited to erosion, as wave run-up and resultant inundation can significantly impact structures and infrastructure along the shoreline. Kahana in West Maui provides another example as the road at both the northern and southern extents of the bay is frequently overtopped during large wave events. According to Holman (1986), Mase (1989), de Waal and van der Meer (1992), and Stockdon et al. (2006), wave run-up is a function of the offshore wave characteristics, bottom bathymetry, and beach topography. Moreover, as postulated by APTIM staff (CPE, 2015) and is currently being investigated by Sciaudone (2017), wave run-up is also influenced by the width of an added beach berm (i.e. through beach nourishment). Beach restoration activities that serve to widen an existing beach often result in reducing the extent of wave run-up, which adds another level of coastal erosion control. Therefore, considering the beach that fronts Lower Honoapiilani Road at Kahana has nearly vanished, beach restoration may mitigate the effects of wave run-up in this area and other areas facing similar challenges.

As discussed above, shoreline protection measures in Hawaiʻi have historically been implemented on a property-by-property basis. This disparate response to coastal erosion has resulted in shoreline hardening (i.e. the construction of seawalls, bulkheads, revetments, etc.). The implementation of these shoreline hardening projects, also known as coastal armoring projects, has contributed to the narrowing and loss of chronically eroding beaches in Hawaiʻi (Romine and Fletcher, 2012; Fletcher et al., 1997; Hwang and Fletcher, 1992). For example, 9% or 13 miles of beaches on Kauaʻi, Oʻahu, and Maui have been completely lost to erosion over the past century, nearly all of which fronted coastal armoring (Fletcher et al., 2012). Table 2 summarizes the results of this study by detailing the length of historic beach studied, extent of beach that has been lost, and length of beach that remains. It should be noted that the referenced study did not document or analyze all beaches, as perched beaches, such as beaches fronted primarily by emergent beach rock or reef rock, or beaches along the Nāpali Coast of Kauaʻi, Hāna and East Maui, or Kāneʻohe on Oʻahu were not included.

Table 2. Length of Beach Studied by Fletcher et al (2012)

	Length of Beach Studied (miles)		
Island	**Historic***	**Lost**	**Remaining**
Oʻahu	66	5	61
Maui	56	4	52
Kauaʻi	47	4	43
Combined	**169**	**13**	**156**

*beach studied by Fletcher et al. (2012)

1.1.3 Outlook for Hawaiʻi Beaches

Sea level rise will increase the frequency and severity of wave inundation, erosion, and flooding events (DLNR, 2017). Either hard (i.e. coastal armoring) or soft (i.e. beach restoration) solutions can be used to mitigate these coastal hazards (i.e. protect upland development). Presently, permitting beach restoration projects in Hawaiʻi is a timely and costly endeavor and, as a result, can be cost prohibitive. However, Hawaiʻi beaches are at risk of being lost should coastal armoring be used to protect beachfront lands and development from these coastal hazards. Therefore, as previously discussed, the State of Hawaiʻi must facilitate alternatives to coastal armoring, such as beach restoration, if our community wishes to conserve beaches for this generation and generations to follow.

Sea level rise is increasing the extent and severity of erosion and loss of beach environments in Hawaiʻi (Romine et al., 2013). Studies have shown that shoreline recession rates are expected to double by mid-century when considering the projected increase in the rate of sea level rise (Anderson et al., 2015). The distance over which waves run-up and wash across the shoreline will increase with sea level rise. As water levels increase, less wave energy will be dissipated through breaking on nearshore reefs and waves will impact the shoreline at a higher elevation, which increases erosion potential.

Observations of shoreline dynamics suggest that the influence of sea level rise on shoreline change is presently minor compared with the influence of sediment availability (sum of sources and sinks) related to human impacts and persistent physical processes such as cross-shore, longshore, and aeolian (wind) sediment transport (Anderson et al., 2015). However, future accelerated sea level rise is expected to have an increased effect on coastal morphology (Stive, 2004), with a vast majority of Hawai'i beaches in a state of chronic erosion by mid-century (Anderson et al., 2015). Sediment transport, and thus shoreline migration, is the result of multiple nonlinear processes that dynamically interact with existing morphology over a variety time and spatial scales (Stive et al., 2002; Hanson et al., 2003). Therefore, beaches will be further shaped by changes in sediment transport patterns as a result of higher water levels over fringing reefs (Grady et al., 2013).

Tidal-flood frequencies for minor (nuisance) impacts are rapidly increasing and accelerating (Thompson et al., 2019; Sweet et al., 2018; Ezer and Atkinson, 2014; Sweet et al., 2014; Sweet and Park, 2014). These impacts were documented statewide by the Hawaiʻi and Pacific King Tide Project, which engaged citizen scientists in documenting tidal flooding during the spring and summer of 2017 (University of Hawaiʻi Sea Grant College Program, 2017). These elevated water levels provided a glimpse of Hawaii's near future. The 2017 NOAA report, *Global and Regional Sea Level Rise Scenarios for the United States*, shows that Hawaiʻi is likely to be among the first states in the nation to experience chronic sea level rise related flooding. For example, assuming an intermediate sea level rise scenario, a flooding event that occurred once every 5 years at the beginning of the century is expected to occur 5 times a year sometime between 2020 and 2030 (an annual probability increase of 25). This sea level rise scenario assumes a 1.0 meter (3.28 feet) sea level increase by 2100, which is an intermediate (i.e. mid-range) scenario based on the latest global mean sea level rise projections from NOAA (Sweet et al., 2017).

Increased conservation and maintenance efforts are needed if beaches are to be sustained for current and future generations, particularly in the face of changing climate and sea level rise. In an effort to quantify future sea level rise impacts, and evaluate the need for mitigation measures, the Hawaiʻi Sea Level Rise and Vulnerability Adaption Report included modeling to determine the potential future exposure of each island to multiple coastal hazards. The report included analysis of coastal hazards considering: passive flooding, annual high wave flooding, and coastal erosion. The impact footprints of these three hazards were combined to define the projected extent of chronic flooding due to sea level rise, termed the sea level rise exposure area (SLR-XA). Not all hazards were analyzed for each island due to limited historical information and geospatial data; therefore, results presented below are only provided for locations where all hazards were modeled (i.e. Oʻahu, Maui, and Kauaʻi). The modeling approach, data inputs, assumptions and limitations, and results are detailed in the Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report (DLNR, 2017).

Using these model results, University of Hawaiʻi Sea Grant assessed the potential for shoreline hardening and beach loss in the Hawaii Sea Level Rise Vulnerability and Adaptation Report. The study looked at the potential for beach loss in the hypothetical scenario that widespread shoreline armoring is permitted fronting threatened buildings and roads. This preliminary assessment does not account for accelerated erosion adjacent to shoreline structures and does not include other adaptation measures (i.e. managed retreat, nourishment, etc.). Assuming widespread armoring, Table 3 identifies the length of beach potentially lost considering 1.0 feet of sea level rise, while Table 4 considers 3.2 feet of sea level rise (DLNR, 2017). Beach loss estimates are categorized by development type in the backshore, such as existing armored sites (i.e. hardened) and roads and buildings that would be sites for potential future armoring if permitted. All beach fronting coastal armoring will be impacted in both scenarios (i.e. potentially lost). However, the length of beach lost that fronts roads and buildings more than doubles when increasing from 1.0 to 3.2 feet of sea level rise.

Table 3. Length of Beach Potentially Lost Assuming Widespread Armoring is Allowed with 1.0 Feet of Sea Level Rise

	Length of Beach* Potentially Lost (miles) Fronting:			
Island	**Armoring**	**Roads**	**Buildings**	**Total**
Oʻahu	18	2	5	25
Maui	11	4	4	19
Kauaʻi	5	2	3	10
Combined	**34**	**8**	**12**	**54**

* studied by Fletcher et al. (2012) and DLNR (2017)

Table 4. Length of Beach Potentially Lost Assuming Widespread Armoring is Allowed with 3.2 Feet of Sea Level Rise

	Length of Beach* Potentially Lost (miles) Fronting:			
Island	**Armoring**	**Roads**	**Buildings**	**Total**
Oʻahu	18	7	13	38
Maui	11	9	7	27
Kauaʻi	5	4	8	17
Combined	**34**	**20**	**28**	**82**

* studied by Fletcher et al. (2012) and DLNR (2017)

Without having the ability to efficiently and cost-effectively implement beach restoration projects, Hawaii's beaches will have one less "tool in the toolbox" to help combat the impacts associated with chronic erosion and sea level rise. Table 5 identifies the length of beach studied that is at risk of being lost on Oʻahu, Maui, and Kauaʻi. Over the past century, these islands have lost 13 miles of beaches, in total. However, the Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report (DLNR, 2017) suggests that an additional 69 miles of beaches could be lost this century if widespread armoring is allowed on eroding beaches. To better understand scale, this is nearly half (44%) of the studied beach length. Even with a sea level elevation increase of 1.0 feet, a third of the remaining beaches studied on Oʻahu and Maui could be lost.

Table 5. Beach at Risk of Loss

	Length of Beach* at Risk (miles)		Percent of Beach* at Risk	
Island	**1.0 Feet SLR**	**3.2 Feet SLR**	**1.0 Feet SLR**	**3.2 Feet SLR**
Oʻahu	20	33	33%	54%
Maui	15	23	29%	44%
Kauaʻi	6	13	14%	30%
Combined	**41**	**69**	**26%**	**44%**

* studied by Fletcher et al. (2012) and DLNR (2017)

The table and discussion above illustrate the severity of the situation. Without facilitating a cost and time effective alternative to coastal armoring, the region within the ahupuaʻa where the land and sea meet may not be accessible in the near future. Beach restoration is one erosion management and coastal hazard mitigation alternative to shoreline armoring that allows us to mitigate the impacts of sea level rise while conserving our beaches for the next generation; however, as the following sections describe, this nature-based solution needs to have a streamlined permitting process for it to be considered a feasible option for a wide range of project types.

1.2 Hawaiʻi Beach Restoration History

The sections that follow discuss the history of beach restoration in Hawaiʻi. Included is a discussion of previous projects and steps that the State of Hawaiʻi has taken to preserve its beaches using nature-based coastal hazard mitigation techniques. Beach restoration is not a new concept as it has been successfully used worldwide and throughout Hawaiʻi to preserve and restore this dynamic natural resource that is influenced by water levels, wave energy, and sand supply.

Beach restoration projects, for the purposes of this EA, are defined as projects that entail beach nourishment, sand pushing, sand backpassing, sand bypassing, and limited use of beach stabilization structures. Many of these beach restoration projects include the use of dredge plants to recover sandy material from marine-based deposits. As such, these "dredge projects", as they are often commonly referred, can also be termed "sand recovery" projects – both of these terms are used interchangeably within this document.

1.2.1 Historical Overview of Beach Restoration in Hawaiʻi

Beach restoration has been practiced in Hawaiʻi since at least 1939 when an experimental project pumped sand from a reef flat to fill a narrow beach fronting the Halekulani Hotel in Waikīkī. Beach nourishment in Hawaiʻi to restore pre-existing beaches and construct new beaches began in earnest in the 1950s during the post-WWII boom. In 1948, the Board of Harbor Commissioners of the Territory of Hawaiʻi commissioned a study focusing on beach erosion in Waikīkī (Wiegel, 2002). The study, which was completed in 1951, recommended a number of improvements to the shoreline at Waikīkī Beach. As a result of this study, the Waikīkī Beach Erosion Control Project was initiated; roughly 300,000 cubic yards of sand was placed on Waikīkī beaches between the late 1950s and late 1970s. However, little to no nourishment was completed following this period, which may be one of the reasons why this project gained a reputation of being "a 50-year series of uncoordinated attempts to restore Waikīkī Beach" (Miller and Fletcher, 2003). Elsewhere in Hawaiʻi, beach nourishment projects had not been constructed until the twenty-first century. Since the year 2000, projects have been implemented on the islands of Kauaʻi, Maui, Oʻahu, and Hawaiʻi. A comprehensive list of beach nourishment projects constructed in Hawaiʻi is shown in Table 6. Additional beach management projects, such as sand pushing and bypassing/backpassing projects, are detailed in Table 7.

Table 6. Hawaiʻi Beach Nourishment Project History

Year	Island	Location	Project Name	Sand Source	Volume (cy)	Length (ft)
1939	Oʻahu	Waikīkī	Kūhiō Beach	-	7,000	-
1957	Oʻahu	Waikīkī	Waikīkī (Kūhiō, Queens, Kapiʻolani)	-	160,000	-
1959	Oʻahu	Waikīkī	Kūhiō Beach	-	19,000	-
1965	Oʻahu	Waikīkī	Outrigger Canoe Club	-	6,000	-
1970	Oʻahu	Waikīkī	Fort DeRussy Beach	-	82,000	-
1972	Oʻahu	Waikīkī	Kūhiō Beach	-	12,000	-
1975	Oʻahu	Waikīkī	Fort DeRussy Beach	-	16,000	-
2000	Oʻahu	Lanikai	Lanikai Beach	-	12,000	-
2003	Oʻahu	Waikīkī	Kūhiō Beach	Offshore	1,400	-
2003	Maui	Kahului	Hawaiian Canoe Club Beach Restoration	Dune	500	250
2003	Maui	Pāʻia	Miller Residence Beach Nourishment	Dune	500	175
2004	Maui	Pāʻia	Fisher Beach Nourishment	Dune	500	100
2005	Maui	Pāʻia	Cirrus Spreckelsville Beach Nourishment	Dune	500	100
2005	Maui	Pāʻia	Nelson (Rixey) Beach Nourishment	Dune	25	260
2005	Kauaʻi	Kōloa	Kauaʻi County Beach Nourishment	Quarry	500	300
2007	Oʻahu	Waikīkī	Kūhiō Beach	Offshore	10,000	1,500
2007	Maui	Pāʻia	Mama’s Fish House	Dune	500	100
2007	Maui	Pāʻia	Sprecklesville Beach Restoration Foundation	Dune	500	500
2007	Maui	Kīhei	Altman Beach and Dune Restoration	Dune	500	75
2007	Oʻahu	Waikīkī	Kūhiō Beach	Offshore	10,000	1,500
2008	Maui	Pāʻia	Cirrus Spreckelsville Beach Nourishment	Dune	3,000	108
2008	Maui	Pāʻia	Sprecklesville Beach Restoration Foundation	Dune	6,500	500
2010	Maui	Pāʻia	Stables Road Beach Restoration	Offshore	2,886	900
2012	Oʻahu	Waikīkī	Waikīkī Beach Improvements	Offshore	27,000	1,700
2012	Maui	Kīhei	Maui Bay Villas (formerly Maui Lu)	Onshore	-	1,000
2013	Oʻahu	Honolulu	Iroquois Point	Offshore	95,000	-
2013	Kauaʻi	Kōloa	Poʻipū Beach Park Nourishment	Quarry	300	500
2015	Maui	Kīhei	Macdonald Kīhei SSBN	Onshore	150	150
2015	Maui	Pāʻia	Sugar Cove AOAO	Dune	8,000	500
2015	Kauaʻi	Kapaʻa	Kapaʻa Pono Kai Beach Restoration	Stream	-	60
2016	Hawaiʻi	Waikoloa	Waikoloa Beach Tsunami Repair	Onshore	-	1,850

Table 7. Hawaiʻi Beach Management Project History

Year	Month	Island	Location	Project Name	Sand Source	Volume (cy)	Length (ft)	Properties
2003	December	Maui	Wailea	Four Seasons Sand Pushing	Stream Mouth	-	-	1
2004	August	Oʻahu	Koʻolauloa	Rathburn Sand Pushing	Kaunala Stream Mouth	< 500	-	6
2005	July	Hawaiʻi	Punaluʻu	Sumada Sand Pushing	Roadway	-	-	-
2006	June	Kauaʻi	Hāʻena	Cooke Sand Pushing	-	-	400	2
2007	February	Oʻahu	Chuns - Leftovers	Brilliant Sand Pushing	Fronting Beach	75	100	1
2007	March	Oʻahu	Pūpūkea	Schieve Pūpūkea Sand Pushing	Fronting Beach	1,400	700	14
2007	March	Oʻahu	Pūpūkea	Schieve Pūpūkea Sand Pushing	Fronting Beach	1,400	700	14
2007	February	Oʻahu	Haleʻiwa	Morine Sand Pushing	-	-	-	-
2007	March	Maui	Kāʻanapali Marriott	Kāʻanapali Marriot Sand Pushing	Fronting Beach	70	300	1
2008	March	Oʻahu	Haleʻiwa	Morine Sand Pushing	-	-	-	-
2008	February	Oʻahu	Haleʻiwa	Morine Sand Pushing	-	-	-	-
2010	September	Oʻahu	Sunset Beach Park	County Sunset Beach Park Sand Pushing	Fronting Beach and Stream Mouth	1,250	250	1
2010	September	Oʻahu	ʻEhukai Beah Park	ʻEhukai Beach Park Sand Pushing	Fronting Beach	250	250	1
2010	August	Oʻahu	Pipeline - ʻEhukai	Scott Sand Pushing	Fronting Beach	400	800	8
2010	November	Oʻahu	Chuns - Leftovers	Brilliant Sand Pushing	-	250	50	1
2011	August	Oʻahu	Mākaha Beach Park	Mākaha Sand Pushing	Fronting Beach	1,800	360	2
2012	March	Oʻahu	Kailua Beach Park	Kailua Beach Park Sand Backpassing	Kaʻelepulu Stream Mouth	2,000	300	11
2013	October	Oʻahu	Sunset-Kammies	Kammies Sand Pushing	Paumalū Stream Mouth	600	400	6
2013	May	Oʻahu	Mākaha Beach Park	Mākaha Sand Pushing	Fronting and Adjacent Beach	3,400	510	2
2013	April	Oʻahu	Kailua Beach Park	Kailua Beach Park Sand Backpassing	Kaʻelepulu Stream Mouth	3,000	360	11
2014	February	Oʻahu	Rocky Point	Lunt, Rocky Point Sand Pushing	Fronting Beach	4,200	1,000	17
2014	July	Oʻahu	Sunset-Kammies	Kernot, Kammies Sand Pushing	Paumalū Stream Mouth	300	200	3
2014	March	Oʻahu	Kailua Beach Park	Kailua Beach Park Sand Backpassing	Kaʻelepulu Stream Mouth	3,000	600	11
2014	April	Oʻahu	Kawailoa - Chun's	Sheil and Morine Kawailoa Sand Pushing	Fronting Beach	50	200	2
2014	May	Oʻahu	Mākaha Beach Park	Mākaha Sand Pushing	Fronting and Adjacent Beach	3,400	510	2
2014	January	Oʻahu	Rocky Point	Lunt Rocky Point Sand Pushing	Fronting Beach	1,700	400	8
2014	July	Oʻahu	Sunset-Pūpūkea	County Pūpūkea and Sunset Beach Park Sand Pushing	Fronting Beach	2,500	1,500	7
2014	November	Oʻahu	Sunset-Kammies	Kammies Sand Pushing	Fronting Beach	300	150	3
2015	March	Oʻahu	Rocky Point	Rocky Point Sand Pushing	Fronting Beach	1,000	500	10
2015	April	Oʻahu	Kailua Beach Park	Kailua Beach Park Sand Backpassing	Kaʻelepulu Stream Mouth	2,000	600	11
2015	April	Oʻahu	Mākaha Beach Park	Mākaha Sand Pushing	Fronting and Adjacent Beach	3,000	360	2
2015	September	Oʻahu	Sunset-Kammies	Kammies Sand Pushing	Fronting Beach and Paumalū Stream Mouth	100	50	1
2015	November	Oʻahu	Sunset-Kammies	Kammies Sand Pushing	Fronting Beach	400	200	4
2015	June	Oʻahu	Sunset Beach	Kaunala Stream Mouth Beach Maintenance	Fronting Beach and Stream Mouth	500	100	1
2016	July	Oʻahu	Sunset-Pūpūkea	County Pūpūkea and Sunset Beach Park Sand Pushing	Fronting Beach	5,000	2,000	12
2016	August	Oʻahu	Mākaha Beach Park	Mākaha Sand Pushing	Fronting and Adjacent Beach	3,000	360	2
2016	October	Oʻahu	Ke Iki Beach	Glaser Ke Iki Beach Sand Pushing	Fronting Beach	500	250	5
2016	September	Oʻahu	Ala Moana Beach Park	Ala Moana Beach Park Beach Maintenance	Adjacent Beach	1,400	280	1
2016	August	Oʻahu	Kahe Beach	HECO Sand Pushing Request	Kahe Outfall	300	60-100	1
2017	March	Oʻahu	Kailua Beach Park	Kailua Beach Park Sand Backpassing	Kaʻelepulu Stream Mouth	2,000	600	11
2017	August	Oʻahu	Sunset-Pūpūkea	County Pūpūkea and Sunset Beach Park Sand Pushing	-	5,000	2,000	12
2017	August	Oʻahu	Sunset-Kammies	Kammies Sand Pushing	Paumalū Stream Mouth	400	200	4
2017	July	Oʻahu	Rocky Point	Rocky Point Sand Pushing	Fronting Beach	1,000	500	10
2017	September	Oʻahu	Mākaha Beach Park	Mākaha Sand Pushing	Fronting and Adjacent Beach	3,000	360	2
2018	March	Oʻahu	Pūpūkea	Schieve Sand Pushing	Fronting Beach	2,200	1,200	24
2018	March	Oʻahu	Rocky Point	Rocky Point Sand Pushing	Fronting Beach	600	300	6
2018	May	Oʻahu	Rocky Point	Rocky Point Sand Pushing	Fronting Beach	500	100	2

1.2.2 Influence of Hawaiʻi Coastal Erosion Management Plan

The Hawaiʻi Coastal Erosion Management Plan (COEMAP) promotes beach nourishment and restoration as a viable alternative to coastal armoring (DLNR, 1999). Development of this strategic plan was initiated January 1996 by the DLNR Land Division to address coastal erosion within a framework of beach protection. With assistance from the University of Hawaiʻi, the COEMAP encourages science-based decisions in beach resource conservation and management. Coordinated efforts resulted in the development of the COEMAP that was adopted in 1999 by the Board of Land and Natural Resources (BLNR). Adoption of the COEMAP led to the establishment of the DLNR Coastal Lands Program (CLP), which is administered by the Office of Conservation and Coastal Lands (OCCL).

The COEMAP provides guidelines and planning approaches for beach protection, management, and restoration. Specifically, the following goals were identified within the plan to improve Hawaii's erosion management system:

1. Promote consistent and uniform policy of erosion management at the state level.
2. Consider erosional trends and processes, and other coastal hazards, at the zoning and subdivision stages of land development.
3. Implement beach and dune restoration with beach nourishment as a viable management option in Hawaiʻi. Streamline and coordinate the permitting necessary to achieve this goal and improve interagency coordination and communication.
4. Implement a continuous source of scientific data and research products to support erosion hazard management decisions.
5. Create and maintain a continuous public education and awareness campaign.
6. Establish coastal land acquisition programs.
7. Develop a technical guidance manual for development, restoration, and redevelopment of the coastline.

Moreover, detailed recommendations and initial implementation steps were included in the plan to improve erosion management in the State of Hawaiʻi.

1.2.3 Hawaii's Existing Small Scale Beach Nourishment Program

The DLNR currently authorizes small-scale beach and dune nourishment projects under its Small Scale Beach Nourishment (SSBN) program. The SSBN program was introduced March 8, 2000 with the publication of a draft statewide Programmatic Environmental Assessment (PEA) in the Environmental Notice. The goal of the program was to reduce shoreline armoring while protecting upland development and enhancing public access with minimal negative environmental consequences. The permitting process was streamlined by consolidating permitting within DLNR, through agreements with the U.S. Army Corps of Engineers and the State Department of Health, Clean Water Branch, with the issuance of the State Programmatic General Permit (SPGP) on April 5, 2005. Projects permitted under the program are limited to the placement of 10,000 cubic yards of beach compatible sand. More than 10 projects (2 projects per year) were permitted and constructed under the program before the SPGP expired April 25, 2010. Since the SPGP expired, applicants have been prohibited from conducting any project activities below the high water line without additional permits. This restriction has deemed many of these small-scale projects unfeasible due to the time and cost involved in securing up to six additional permits. As a result, the number of projects permitted under the program since the expiration of the SPGP has decreased to less than one project per year. Moreover, restoration of a degraded beach system often requires placement of sand both above and below the water line to meet design and advanced fill volumetric requirements.

1.2.4 Hawaiʻi Beach Restoration Outlook

Nature-based techniques, such as beach nourishment and restoration, are being recognized federally and at the state level as effective methods for addressing coastal erosion without compromising natural resources and processes (USACE, 2018). The Hawaiʻi Shore and Beach Preservation Association (HSBPA) identified beach restoration as an economically and environmentally viable alternative for managing Hawaii's eroding beaches for the purposes of environmental conservation and mitigation of coastal hazards (HSBPA, 2014). The number of SSBR projects is likely to increase with increasing public awareness of nature-based beach management and restoration alternatives through a streamlined SSBR program and its benefits and increasing need for coastal erosion control with climate change and sea level rise.

It is estimated that 30 to 40 SSBR projects will be permitted over the first 5-years of program implementation. This assumes that a State Programmatic General Permit (SPGP) or Regional General Permit (RGP) is approved and valid over this 5-year period. This estimate was obtained by compiling the number of beach nourishment (Table 6) and beach management (Table 7) projects permitted over 5-year periods since the year 2000 (see Table 8). Beach nourishment project permitting peaked when the SSBN program started, with 12 nourishment projects permitted between 2003 and 2007. Beach management project permitting has increased in recent years due to increasing coastal erosion impacts, with 27 projects authorized between 2014 and 2018. Combined, the number of beach nourishment and beach management projects have increased in recent years. Considering the historic trend of permits issued over the past 19 years combined with other pressures acting on Hawaii's sandy shoreline (sea level rise projections and associated impacts and recent erosion and flooding impacts that heighten awareness), it is likely that 30 to 40 SSBR projects will be permitted over the first 5-year period of a SPGP or RGP.

Table 8. Hawai'i Beach Restoration Projects Permitted Over 5-Year Periods

Year		Permitted Projects		
From	**To**	**Nourishment**	**Management**	**Combined**
2000	2004	5	2	7
2001	2005	7	3	10
2002	2006	7	4	11
2003	2007	12	9	21
2004	2008	11	10	21
2005	2009	10	9	19
2006	2010	8	12	20
2007	2011	8	12	20
2008	2012	5	8	13
2009	2013	5	9	14
2010	2014	5	17	22
2011	2015	7	19	26
2012	2016	8	23	31
2013	2017	6	27	33
2014	2018	4	27	31

1.3 Hawai'i Beach Restoration Regulations

Hawai'i has been characterized as one of the most heavily regulated of all the 50 states (Callies, 2010). The regulatory system is largely borne from a centralized state land use system, the federal regulations to protect public health and the environment, increased public participation in the planning process, and Hawaii's unique environmental and cultural qualities and challenges. Thus, because of the uncertainty of permitting beach restoration projects in Hawai'i, the entitlement process can be arduous, time consuming, and costly. As Callies notes, "clean water is particularly important to Hawai'i. Tourists are the consumers of the major state industry, and they flock to Hawai'i for the beaches, the waterfalls, the marine wildlife, and the diving and snorkeling. Hawaii's regulators are aware of the importance of maintaining that experience for visitors." (Callies, 2010). Current and proposed regulatory processes for beach restoration projects are detailed in the following sections.

1.3.1 Current Regulatory Process

In Hawai'i, all submerged lands (i.e. lands located seaward of the shoreline as determined per HRS Chapter 205A) are zoned in the Conservation District and are regulated and owned by the State of Hawai'i Department of Land and Natural Resources (DLNR). Congress granted state ownership over submerged lands out to three nautical miles from the coastlines in 1953 under the Submerged Lands Act.

A Conservation District Use Permit (CDUP) is required for beach nourishment because the activity occurs on submerged lands. The CDUP is a discretionary permit granted by the State of Hawai'i

Board of Land and Natural Resources (BLNR). Issuance of the CDUP is contingent upon the project conforming to the following criteria (Hawaiʻi Administrative Rules, Section 13-5-30):

1. The proposed land use is consistent with the purpose of the conservation district;
2. The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur;
3. The proposed land use complies with provisions and guidelines contained in Chapter 205A, HRS, entitled "Coastal Zone Management", where applicable;
4. The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community, or region;
5. The proposed land use, including buildings, structures, and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels;
6. The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable;
7. Subdivision of land will not be utilized to increase the intensity of land uses in the conservation district; and
8. The proposed land use will not be materially detrimental to the public health, safety, and welfare.

Of the criteria listed above, the most critical is that the proposed land use will not cause substantial adverse impacts to existing natural resources within the surrounding area, community, or region.

The CDUP may be issued after public hearings and acceptance of an Environmental Assessment (EA) or Environmental Impact Statement (EIS), which includes an assessment of potential impacts to cultural and archeological resources, unless exempt. At the federal level, there is one primary agency with regulatory authority for beach nourishment projects in Hawaiʻi. Projects taking place in navigable waters of the United States must comply with Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act which are administered through the U.S. Army Corps of Engineers (USACE), Regulatory Section. Beach nourishment projects also require a Section 404 Dredge and Fill permit, otherwise referred to in Hawaiʻi as a Department of the Army (DA) permit, which is issued by the USACE.

The USACE coordinates with the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS), and the Environmental Protection Agency (EPA) through an informal or formal consultation process to ensure that any given beach restoration project adheres to the federal guidelines and laws under each agency's purview in the regulatory process.

NMFS is responsible for the stewardship of the nation's living marine resources and their habitat within the United States Exclusive Economic Zone, which extends from 3 to 200 nautical miles offshore. Under the Marine Mammal Protection Act and the Endangered Species Act, NMFS covers protected species such as whales and turtles. In Hawaiʻi, NOAA has a variety of programs dedicated to the protection of endangered species including Humpback Whales, Hawaiian Monk Seals, and sea turtles. In addition, the Essential Fish Habitat (EFH) provisions under the

Magnuson-Stevens Fishery Conservation Act direct NMFS to protect EFH throughout the range of federally-managed species. This includes state and federal waters.

The USFWS has natural resource stewardship responsibilities in the terrestrial, marine, estuarine, and freshwater ecosystems of the United States of America, and extends to U.S. territories and Compact nations. In Hawaiʻi, the USFWS has a variety of programs dedicated to the protection of hundreds of endangered species, as well as trust resources such as coastal and coral reef ecosystems. For the USACE regulatory permitting process, the USFWS provides consultations and technical assistance under authorities such as the Endangered Species Act, Migratory Bird Treaty Act, the Clean Water Act, the Rivers and Harbors Act, the Fish and Wildlife Coordination Act (FWCA), and the National Environmental Policy Act. These consultations encompass federal trust resources in state and federal waters. The FWCA provides the basic authority for the Secretary of the Interior, through the USFWS, to assist and cooperate with federal, state, and public or private agencies and organizations in the conservation and rehabilitation of wildlife. The NMFS provides similar assistance and cooperation for wildlife species under the management responsibilities of the Department of Commerce. For water development projects, consultation under the FWCA is to be conducted with the USFWS, NMFS, and the agency administering the wildlife resources of the state in which the project is located.

The EPA is an agency of the United States federal government whose mission is to protect human and environmental health. Headquartered in Washington, D.C., the EPA is responsible for creating standards and laws that promote the health of individuals and the environment. The EPA seeks to protect and conserve the natural environment and improve the health of humans by researching the effects of and mandating limits on the use of pollutants. The agency regulates the manufacturing, processing, distribution, and use of chemicals and other pollutants. Accordingly, the EPA along with the USACE developed water quality guidelines governed under Section 401 and 404 of the Clean Water Act (CWA), which set forth procedures for determining if a beach restoration project is in compliance.

Beach nourishment projects must also comply with the provisions of the federal Clean Water Act and Coastal Zone Management Act. Compliance review and permitting for these two laws has been delegated to state authorities in Hawaiʻi. The Hawaiʻi State Department of Health, Clean Water Branch (CWB) administers the Clean Water Act through their Section 401 Water Quality Certification (WQC) and National Pollution Discharge Elimination System (NPDES) permits.

The purpose of the Clean Water Act is to eliminate releases of high amounts of toxic substances into water, eliminate additional water pollution, and ensure that surface waters meet standards necessary for human sports and recreation. The Section 401 WQC is intimately tied to the federal DA permit, which must also address Clean Water Act provisions. Thus, issuance of the DA permit is contingent upon the issuance of the WQC by the Hawaiʻi CWB.

With respect to projects that require a federal permit, such as the DA permit, the State of Hawaiʻi Coastal Zone Management Office administers the provisions of the Coastal Zone Management Act through the issuance of a Coastal Zone Management (CZM) consistency determination.

1.3.2 Proposed Regulatory Process for Small Scale Beach Restoration Projects

In an effort to manage erosion stress, reduce impacts associated with climate change and sea level rise, increase coastal resiliency, and facilitate conservation and restoration of beach and dune ecosystems, the DLNR wishes to enhance the SSBN program and implement a streamlined and coordinated regulatory process, particularly among the DLNR, USACE, and DOH, for small-scale beach restoration projects. As such, the DLNR proposes to re-establish a streamlined SSBR permitting program that not only offers beach nourishment as a viable ecosystem-based management option to address coastal erosion but provides additional alternatives to managing beach sand to conserve this limited resource. Moreover, the program refines the definition of *small*, by limiting the sand placement area to the historically sandy area, to better avoid environmental impacts.

The purpose of the SSBR program is to provide a streamlined permitting approach that will allow for the implementation of coastal erosion control projects that will result in ecosystem restoration and improved public beach access while conserving Hawaii's critical socio-cultural resource and a key attraction for Hawaii's visitor-based economy. Beach restoration projects with properly planned and executed nourishment programs will assist in managing erosion threats to shoreline property and infrastructure, reduce impacts associated with climate change and sea level rise, and increase overall coastal resilience. Properly designed beach restoration projects can have other benefits within the broader coastal zone and ahupuaʻa such as ensuring the continued provision of habitat for various threatened and endangered species, protecting cultural sites and burials in the backshore, maintaining access to traditional fishing grounds and for other cultural and recreation practices such as diving and surfing, and improving water quality by providing a natural buffer between waves and exposed soil deposits and on-site sewage disposal systems along eroded shorelines. The goal of the program is to facilitate cost-effective and timely permitting of small-scale beach restoration projects. The streamlined regulatory process proposed as part of this program is detailed in Section 2.2.

1.3.3 Scope and Authority of Environmental Assessment

This draft PEA has been prepared pursuant to Hawaiʻi Revised Statutes (HRS) Chapter 343 and Hawaiʻi Administrative Rules (HAR) Section 11-200. This Environmental Assessment is meant to provide the public, government agencies, and stakeholders with an opportunity to review and consider any potential impacts of proposed programmatic actions and their alternatives on natural and cultural resources. This document serves as an environmental disclosure document, including identification of the purpose and need for the proposed action (Section 1), proposed actions and alternatives (Section 2), description of environmental setting (Section 3), potential environmental impacts (Section 4), and measures to avoid or minimize any impacts (Section 5). The information detailed in this document provides the basis for determining whether a Finding of No Significant Impact (FONSI) is appropriate (Section 6). This document concludes with a description of applicable Environmental Regulations and Permits (Section 7), a summary of Agencies Consulted (Section 8), a List of Preparers (Section 9), and closes with Literature Cited (Section 10).

1.4 Geographic Scope of Analysis

The proposed project areas include the coastal land areas, shoreline areas, and nearshore ocean waters within the State of Hawaiʻi. This includes the Main Hawaiian Islands (i.e. the Islands of Hawaiʻi, Maui, Molokaʻi, Lānaʻi, Oʻahu, and Kauaʻi), but does not include the Northwest Hawaiian Islands, Niʻihau, Kahoʻolawe, and smaller islets located offshore of the main islands. The specific geographic area of each individual project is defined by the project and littoral cell extents.

1.4.1 History of Hawaiian Beaches

The Main Hawaiian Islands are characterized as basalt shield volcanos that formed through volcanic activity originating from the Hawaiʻi hotspot. The geologically youngest islands are positioned near this hotspot, which is located just south of the Island of Hawaiʻi. As the islands shifted towards the northwest, away from the hotspot, they slowly eroded and subsided and fringing reefs developed around the islands. These reefs are primarily composed of scleractinian (stony) corals and calcareous algae, both of which deposit calcium carbonate onto the reef framework. Hawaii's fringing reefs are a complicated patchwork of fossil reefs formed at various sea level stands over the past several hundred thousand years with the coming and going of ice ages. The reefs are incised by relict channels and depressions from meteoric erosion during lower sea level stands. Modern reef growth on Hawaii's fringing reefs is typically limited to a thin veneer on the upper fossil reef platform with most growth occurring seaward of the reef crest in deeper waters (Fletcher et al., 2008). Fringing reefs, along with barrier reef and non-structural reef communities, and their associated marine organisms (foraminifera, mollusks, and echinoids), are the source of calcium carbonate sediment for Hawaiian beaches (Fletcher et al., 2012; USACE, 2018).

Over time, mechanical processes, such as wave and current action, and biological processes, such as bioerosion by parrotfish, erode the reef structures and create calcium carbonate sand. The mechanical processes also erode the volcanic headlands to create the less ubiquitous basalt-based sand. The combination of the basalt sand and alluvial volcanic sediment deposited by streams and eroded from headlands are the basis for black sand (Harney and Fletcher, 2003). Calcareous white sands make up approximately 95% of the beaches in Hawaiʻi and only 5% are composed of black sand (USACE, 2018). Overall, both sand types are very limited throughout the archipelago, especially compared to the availability of siliciclastic sand along continental shorelines.

Due to the relatively limited sediment supply, Hawaiʻi beaches are typically narrower than continental beaches. Sediment can be lost from a littoral system by seaward transport beyond the reef crest and through paleo stream channels. However, sand accumulations in channels and offshore reef surfaces may also be active components of beach sand and offshore sand exchanges (USACE, 2018). Radiocarbon dating has been used to better understand the geological timescale in which carbonate sands are produced, transported, and lost from the coastal system. A study conducted for Kailua Beach determined that beach and offshore sediments ranged from 500 to 2,000 years old (Fletcher et al., 2012; Harney et al., 2000). Kailua Beach is located on the island of Oʻahu, which holds more than one-fourth of all beach sand found in Hawaiʻi. Oʻahu and Kauaʻi hold 61.4% of the total beach sand found throughout the Hawaiian Islands (Fletcher et al., 2012).

1.4.2 Types of Hawaiian Beaches

Mechanical processes, such as currents and wave action, influence both the reef and beach morphology along the Hawaiian shorelines. Beaches that are positioned on north and west facing shorelines are exposed to waves generated from the strong North Pacific swells during the winter months. This results in the north and west facing shorelines having reefs that are generally narrower, deeper, and more irregular and beaches that steepen and narrow with large waves in the winter. As the year transitions to summer, the North Pacific swell subsides and the smaller, long-period South Pacific swell affects the islands and generally results in longer and wider beaches on the north and west facing shorelines (Fletcher et al., 2012; Romine et al., 2013).

Similar processes affect the grain size and distribution of sand in Hawaiʻi. For example, beaches exposed to persistent trade winds generally consist of fine-grained sand, while beaches along north and west shores exposed to large winter waves tend to have coarser sand (Moberly and Chamberlain, 1964). The combination of the persistent trade wind waves, consistent wave heights and wave periods found on the windward or northeast facing shorelines effectively sort the sediment and reduce the grain size (Fletcher et al., 2012; Moberly and Chamberlain 1964; USACE, 2018). In contrast, the north and west shores are only exposed to the strong North Pacific swell waves for a portion of the year, therefore the sediments are not subjected to the constant abrasion. Also, the strong waves may move the finer grained material offshore along these beaches. Overall, beach sand grain size varies significantly in Main Hawaiian Islands ranging from coarse to fine-grained.

The described environmental processes influence the types of beaches found throughout the archipelago, which include open coast beaches, pocket beaches, and embayments. Open coast beaches can range from the coastal strand plane and dunes on the Mānā coastal plain located in west Kauaʻi to the highly urbanized and engineered beaches at Waikīkī located on Oʻahu (Romine, 2013). Pocket beaches are typically shorter than other beach types and have little to no sediment exchange with the adjacent shorelines. They form between two headlands along rocky shorelines and can be found on most of the islands including Kauaʻi, Oʻahu, Maui, and Hawaiʻi (USACE, 2018). An embayment is characterized by a recess along a coastline, typically between two rocky headlands, and may be connected to the upland via streams and rivers (Fletcher et al., 2012). Embayment beaches range in length and can be found on most of the islands including Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Fletcher et al., 2012; USACE, 2018).

1.4.3 Relevant Resource Issues

Potential environmental impacts of the SSBR program, as described in detail within Section 4, will be avoided or minimized by the implementation of a wide range of Best Management Practices (BMPs), such as limiting nourishment volumes, bounding placement extents by the historic beach, excluding sensitive/protected areas, and dictating sediment quality (see Section 5). In general, resource issues include those pertaining to biological resources (threatened and endangered species, habitats, etc.), water quality, air quality, noise, cultural resources, natural hazards, recreation, and socioeconomic issues.

1.5 Utility and Challenges of Beach Restoration in Hawaiʻi

Beach restoration has been identified as an economically and environmentally viable alternative for managing Hawaii's eroding beaches for the purposes of environmental conservation and mitigation of coastal hazards (HSBPA, 2014). In other parts of the coastal United States, beach nourishment is the preferred or required alternative to armoring (USACE, 2018). The HSBPA held a Beach Restoration Workshop November 24, 2014 with association members and a range of local stakeholders to identify needs, opportunities, and challenges associated with beach maintenance and coastal management in the State of Hawaiʻi. The workshop determined that the permitting process for beach maintenance and restoration is presently time-consuming and cost-prohibitive for many projects in Hawaiʻi. Therefore, the primary recommendation identified during the workshop was that the permitting process for beach restoration projects needs to be streamlined if conservation of the state's sandy beaches is going to be a priority for the environment, hazard mitigation, and the economy.

1.5.1 Beach Restoration Benefits

Natural approaches to coastal erosion control, such as beach nourishment and restoration, offer a wide range of benefits. The primary benefit is hazard mitigation, whereby wave run-up becomes reduced thereby serving to reduce flooding and coastal erosion. As such, beach restoration projects inherently serve to build coastal resilience and help combat the effects of rising sea levels. They help preserve shoreline access for locals and visitors alike who utilize the shorelines in Hawaii for recreational, spiritual, and cultural activities. In addition, beach restoration projects help preserve the natural environment by maintaining good nearshore water quality (due to the reduction in backshore erosion and associated turbidity) and providing adequate habitat for a wide range of flora and fauna that utilize beaches for part of their life cycle. Lastly, the implementation of these projects help ensure that the tourist-based economy is maintained. A beach restoration project generally improve the aesthetic quality of the beach resource, and in some instances, construction may be more affordable than traditional coastal armoring (USACE, 2018).

Beaches are critical to the traditional and customary practices of Native Hawaiians. Traditional and customary practices are protected under the Hawaiʻi State Constitution, Article XII, Section VII. Ranging from fishing and gathering practices associated with the management of natural resources to use of coastal areas for spiritual and ceremonial purposes, cultural activities that occur along beaches are essential to the preservation of the living culture of Native Hawaiians.

1.5.2 Beach Restoration Challenges

Beach restoration challenges include sensitive cultural issues, potential environmental effects, permitting processes, sand resource limitations, water quality regulations, project cost and funding mechanisms, and equipment availability. Each of these beach restoration challenges are discussed in further detail below.

1.5.2.1 Sensitive Cultural Issues

The long and rich cultural history of the Hawaiian Islands is deeply connected to the shoreline and nearshore environment. This spiritual connection includes traditional practices of using both the sand dunes and the sea as burial grounds for their ancestors. Protecting and preserving burial grounds present a challenge when sourcing sand or constructing projects.

In the 1980's, over 1,000 burials dating back approximately 1,000 years were discovered in the sand dunes during a hotel development project on the northwest shore of Maui. Native Hawaiians demanded the relocation of this project off the dune sites, and in response, the State Historic Preservation Division (SHPD) was created and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 was passed. The SHPD and NAGPRA program work with lineal descendants and decide whether to reinter, relocate, or reclaim the recovered remains and/or cultural objects.

The cultural connection to the sea is also reflected in the traditional fishing practices of Native Hawaiians. Fishing shrines and altars were often erected along the shoreline, marking where first-caught fish offerings were given to the gods; cultural artifacts at these structures may be found in those areas. Native Hawaiians also used the natural morphology of the coast to construct fishponds, or loko iʻa, which served as traditional aquaculture systems. In the height of Native Hawaiian aquaculture, some 400 fishponds produced over 2 million pounds of fish per year, but by 1970 the ponds only produced 20,000 pounds of fish and in 2016 there were only an estimated 12 active ponds (USACE, 2018). This major decrease is due to erosion, residential and commercial coastline development, and mud deposition by introduced mangroves (Feirstein and Fletcher, 2002). Erosion of the uplands and mud deposition greatly increased the siltation within the affected fishponds and others were completely filled to create space for commercial development (Greene, 1993).

There are also a wide range of sub-surface cultural deposits associated with recreational use of the beach and shoreline. These cultural resources include cultural materials associated with fishing practices, surfing, canoe paddling activities, sailing and navigation traditions, habitation, subsistence practices, and other such activities.

Historic properties potentially eligible for protection under state and federal law may also include post-contact (post 1778 AD) and historic-era (over 50 years old) sites such as seawalls, piers, coastal defense structures, and other military era constructs and sites. Therefore, it is critical to be mindful of potential cultural resources and history of the area when conducting work along shorelines in Hawaiʻi.

1.5.2.2 Potential Environmental Impacts

The nearshore marine environments surrounding the Hawaiian Islands include sensitive coral reefs. These ecologically important benthic habitats support benthic organisms, invertebrates, and fish species. Beach restoration projects have the potential to negatively affect these habitats through direct and indirect impacts if not planned and implemented carefully. For example, direct impacts, such as anchor or pipeline damage, may occur during sand recovery activities and indirect impacts, such as increased turbidity and sedimentation on the reef, may occur during sand placement activities. The dynamic and heterogeneous nature of these benthic habitats can make it difficult to determine whether or not changes within these environments are due to project effects or natural variation.

1.5.2.3 Permitting Process

The existing permitting process for beach restoration projects that involve the placement of material below the Mean High Water (MHW) line is a time-consuming process, which often times makes restoration projects impractical and cost-prohibitive. The HSBPA held a beach restoration workshop November 24, 2014 to identify needs, opportunities, and challenges associated with beach maintenance and coastal management in the State of Hawaiʻi. The primary recommendation identified during the workshop was that beach restoration permitting needs to be streamlined if conservation of the State's sandy beaches is going to be a priority for the environment, hazard mitigation, and the economy (HSBPA, 2014).

1.5.2.4 Sand Resource Limitations

Hawaiʻi beaches are primarily carbonate (limestone) sediment derived from the nearshore reef. Therefore, sand is a finite resource limited to beach strand plain deposits overlying narrow coastal plains, in low-lying dune systems, narrow beaches, and within depressions and channels on the nearshore reef. Sand supplies are not easily accessible and may require dredging, mining, transportation, storage, and in some cases cleaning and processing (i.e. screening, washing, etc.). Not all marine-based sand deposits contain beach compatible sand, as some are poorly sorted, containing beds (lenses) of coarse material (e.g. gravel) and fine sediment (e.g. silt).

1.5.2.5 Water Quality Regulations

In Hawaiʻi, compliance with the provisions set forth in the Section 401 Water Quality Certification is challenging for several reasons. For beach nourishment projects, the Hawaiʻi Department of Health Clean Water Branch considers sand a pollutant under their Administrative Rules. Thus, even bypassing pollutant-free beach quality sand from one area of an active beach to another area of that beach requires a Water Quality Certification, and for projects affecting more than one acre a National Pollution Discharge Elimination System Permit is also required.

In addition, water quality regulations currently require that marine sands be dewatered prior to placing the material on the beach. This makes projects cost-prohibitive and can result in the loss of beach compatible sand. For example, a recent USACE Regional Sediment Management Study (Molina and Podoski, 2018) evaluated beneficial reuse of material cleared from the navigation channel entrance at Haleʻiwa Harbor on the North Shore of Oʻahu during maintenance operations. The study, which assumed that any sand placed on an adjacent beach would have to be dewatered, determined that it was less costly to haul the beach compatible material roughly 50 miles to the Honolulu Harbor Offshore Dredge Disposal Site (ODMDS) located on the other side of the island than place the sand on the adjacent beaches. Fine materials are washed out during direct hydraulic placement of beach fill (i.e. no dewatering), which results in the potential for elevated turbidity in nearshore waters. Although turbidity may occur during the construction process, the sand added to the recipient beach would stem any chronic turbidity that would otherwise occur due to eroding soils entering the nearshore waters. Therefore, beach restoration projects that are not implemented due to the high cost associated with dewatering may ultimately result in a chronic increase in turbidity within nearshore waters.

1.5.2.6 Cost and Funding

Beach restoration projects are limited by the high costs of construction and available funding sources. Government funding sources in Hawaiʻi include the DLNR Beach Fund, special tax districts, Legislative Capital Improvement Project allocations, and county allocations. The DLNR Beach Fund is supported by revenue from coastal land use applications, fines, easements issued to private landowners who have encroaching land uses on submerged state lands, and an allocation from State Transient Accommodations Tax revenues. Although this fund partially supported the Waikīkī Beach Restoration project in 2012, it does not have the annual revenue needed to support major beach restoration projects (HSBPA, 2014).

In the continental United States, the USACE is involved with numerous beach restoration projects along the coasts. However, the Federal Standard regulation and the priority of allocating funds to storm damage reduction projects limits the opportunities for Hawaiʻi to qualify for federal funds. Moreover, the Federal Standard regulation directs the USACE to select the least-cost environmentally acceptable plan for disposing dredged material, which, as discussed in Section 1.5.2.5 above, presently works out to be an ocean disposal site rather than transfer to a beach nourishment site (HSBPA, 2014; USACE, 2018). Previous beach nourishment projects in Hawaiʻi have been funded by private sources and/or through local government agencies. The HSBPA (2014) recommends that future projects seek joint funding sources and implement cost-sharing among projects that take advantage of economies of scale by conducting large-scale beach restoration projects.

1.5.2.7 Equipment Availability

The sensitive marine environment and current water quality regulations also present challenges regarding the type of equipment that may be used to construct beach restoration projects. The combination of the shallow reefs and the draft needed for barges to access the shoreline potentially limits the ability of transporting recovered sand to project areas. Also, the distance from the sand source to the beach and the type of equipment available may affect the feasibility of constructing a project. For example, the USACE usually uses the hopper dredge, Dredge Essayons, for authorized projects in Hawaiʻi; however, this dredge can only dump in waters that are at least 35 feet deep and cannot pump to shore. Other private dredges with the capability of pumping sand to shore may be used, but current dewatering requirements mentioned in Section 1.5.2.5 above tend to inhibit this option (USACE, 2018).

2 PROPOSED ACTION AND ALTERNATIVES

This section describes the alternatives under consideration in this Programmatic Environmental Assessment. Two alternatives have been identified:

- Alternative 1 – No Action (i.e. individual permits and existing SSBN program)
- Alternative 2 – Small Scale Beach Restoration Program with consolidated permitting (Proposed Action)

2.1 Alternative 1: No Action

Coastal erosion control projects in Hawai'i currently include the following general activities:

- Beach management (e.g. sand pushing, backpassing, and bypassing)
- Beach maintenance (e.g. recovery, transport, and placement of beach compatible fill)
- Beach stabilization (e.g. groins)
- Coastal armoring (e.g. seawalls, revetments)

Components listed above are either constructed individually or can be combined to meet restoration goals. For example, appropriately siting and prefilling beach stabilization structures (e.g. groins) may be used in combination with beach nourishment to stabilize the restored beach planform. The current regulatory system allows for the permitting and construction of these activities. However, it does not provide a streamlined permitting approach. Under Alternative 1 (No Action), these activities will continue, though timing and cost for planning and permitting will likely remain cost prohibitive for many smaller projects.

The goal of the existing SSBN program is to reduce shoreline armoring while protecting upland development and enhancing public access with minimal negative environmental consequences. Although the permitting process was previously streamlined (state and federal blanket authorizations have long since expired), applicants are now prohibited from conducting any project activities below the Mean High Water (MHW) line without additional permits (see Section 1.2.3 for details). This restriction has deemed many of these small-scale projects unfeasible due to the time and cost involved in securing up to six additional permits. The State is concerned that lack of viable alternatives could result in coastal armoring at the detriment of Hawaii's public beach environment.

Potential environmental impacts from general activities identified above stem largely from beach maintenance operations and construction of structures in the water. Beach maintenance involves the recovery, transport, and placement of beach compatible fill, which maintains the general character and functionality of the beach and adjacent dune and coastal system, using hydraulic (e.g. sand slurry pumping) and mechanical (e.g. truck-haul, excavator, bulldozer) systems. Coastal structure (e.g. beach stabilization structures, coastal armoring structures, etc.) construction involves the movement and physical placement of structural components (e.g. armor stone, marine mattress, filter fabrics, sheet pile, etc.) using mechanical (e.g. truck-haul, excavator, bulldozer, crane, etc.) systems.

2.2 Alternative 2: Small Scale Beach Restoration Program (Proposed Action)

The proposed action includes the development of a streamlined regulatory process that facilitates the management, maintenance, and restoration of existing and historic (i.e. eroded, lost) beaches across the State of Hawaiʻi. In an effort to enhance public beaches with minimal negative environmental consequences, a programmatic goal is to provide an incentive for oceanfront property owners to seriously consider beach nourishment as an alternative to coastal armoring, which can be achieved through small-scale beach restoration project permit streamlining. This program would create a streamlined and simplified permitting process for obtaining approval to undertake small-scale beach restoration activities. The process would provide homeowner associations, individual land owners, and governmental agencies the option to obtain federal and state approvals through the submittal of a single application to the DLNR OCCL.

This option would only be available for beach restoration activities that meet the criteria set forth in this PEA (as described in detail below), which excludes any activities that would cause significant negative impacts to any biological or cultural resources. Eligible activities for which BMPs and permit conditions will minimize and/or avoid negative impacts to the extent that they become insignificant can be permitted under the program and are covered by this PEA.

2.2.1 Systems Eligible for Application Under the Program

All existing and historic beaches will be eligible for application under this program. All small-scale beach restoration activities will occur within state waters (i.e. for beach fill recovery) and/or along the existing beaches on any of the six Main Hawaiian Islands (i.e. Hawaiʻi, Maui, Molokaʻi, Lānaʻi, Oʻahu, and Kauaʻi).

Beach restoration activities are generally confined to a littoral cell to promote sustainable management based on understanding localized sediment sources, transport paths, and sinks, as well as natural and anthropogenic drivers of change. A littoral cell is a coastal compartment that encompasses a complete cycle of sedimentation including sources, transport pathways, and sinks. Such cells are generally isolated sedimentologically from adjacent coastal reaches in which geologic features (i.e. protruding headlands, submarine canyons, inlets, river mouths, etc.) obstruct littoral transport from one cell to the next. Artificial terminal structures such as groins, jetties, and breakwaters, as well as dredged channels, can also separate littoral cells. For the purposes of this program, littoral cells may be defined based on existing or restored conditions.

2.2.2 Activities Eligible for Application Under the Program

Activities that will be eligible for application under the program are limited to beach management, maintenance, and restoration activities that meet the criteria set forth in this PEA, which excludes any activities that would cause significant negative impacts to environmental or cultural resources. Best management practices and other permit conditions were developed through this PEA process to minimize and avoid negative impacts to the extent that they can be permitted by the state under the program. Activities are limited such that the equilibrium toe of the restored beach remains within the historical extent of the beach.

Site visits were conducted to identify the types of project sites and actions to be included within the proposed SSBR program. The goal of these site visits was to develop an understanding of what aspects of the SSBN program met the needs of stakeholders and where improvements could be made. This information, combined with the review of project specifications and performance, were used to define categories of projects to be included within the SSBR program. Site visit details are provided in Appendix A, while actions identified for inclusion within the SSBR program are detailed below.

- **Beach Management Operations.** Beach management operations include sand pushing, backpassing, and bypassing. Sand may be moved within the littoral cell from an area of beach accretion to an area of beach erosion to manage chronic and seasonal erosion hazards. Sand may be pushed from the lower to the upper profile to manage erosion and run-up impacts, redistributed to rebuild dunes, berms, and beach slopes, and occasionally from behind the shoreline back to the active beach to mitigate loss of sand due to wave overwash. Sand backpassing may be used as a recycling mechanism to move sand from a sink (e.g. stream mouth) back to its source. Moreover, sand bypassing may be used as a mechanism to redistribute sand around a natural or man-made littoral transport obstruction such as a stream mouth, channel, harbor, or groin to manage downdrift effects. Beach management operations will be designed to include appropriate buffers around any significant biological or cultural resources and avoid any negative effects to coastal processes or recreational resources. The volume of sand that may be moved will be governed by permit categories (Table 10), engineering judgement, and best available data such as topographic and bathymetric survey data, LIDAR (Light Detection and Ranging) data, aerial photographs, and historical erosion studies. The equilibrium toe of the restored beach will remain within the historical extent of the beach. Sand may be moved using mechanical and hydraulic systems.

- **Beach Maintenance Operations.** Beach maintenance operations include the recovery, transport, and placement of beach compatible fill to maintain the general character and functionality of the beach and the adjacent dune and coastal system. Beach fill that meets compatibility criteria (as defined in Section 5.6) may be used to restore or nourish beaches and dunes to mitigate erosion and shoreline flooding impacts and improve public beach access and the beach environment. Beach fill may come from upland and stockpiled sources, stream mouths, harbors, and both nearshore and offshore waters. Nearshore and offshore deposits, although similar in character (i.e. both are marine-based), differ in that nearshore deposits are generally part of the active littoral system while offshore deposits are generally detached from the active littoral system due to bathymetry (i.e. in deeper water, seaward of the reef crest). All beach fill recovered from stream mouths and the nearshore will remain within the littoral cell, while beach fill recovered from harbors and offshore may be passed to an adjacent littoral cell. The design of the beach fill recovery, transport, and placement areas will be governed by sediment characteristics, appropriate buffers around any significant biological or cultural resources, and the avoidance of any negative effects to coastal processes or recreational resources. The volume of beach compatible fill that may be recovered, transported, and placed will be governed by permit categories (Table 10), engineering judgement, and best available data such as topographic and bathymetric survey data, LIDAR data, aerial photographs, and historical erosion studies. The equilibrium toe of the restored beach will remain within the historical extent of the beach. Beach fill may be recovered, transported, and placed using mechanical and hydraulic systems.

- **Beach Stabilization Structures.** Beach stabilization structures (e.g. groins) may be used to stabilize placed sand within a littoral cell in certain cases. These structures may be considered when it is clearly demonstrated that they are appropriate for the existing littoral system (i.e. for the existing natural and/or engineered shoreline environment) and will avoid any negative effects on the beach or marine environment. Beach stabilization structures should be combined with beach nourishment to offset historical losses and restore the beach. Beach stabilization structures may include, but not be limited to, the following components: sand filled geotextile bags or tubes, stone filled marine mattresses, geotextile filter fabric, core stone, armor stone, steel or vinyl sheet pile, timber piles, and concrete, among others. The design of beach stabilization structures will include appropriate buffers around any significant biological or cultural resources and avoid any negative effects to coastal processes or recreational resources; for example, beach stabilization structures will be appropriately sited and prefilled in an effort to avoid any negative effects to adjacent and downdrift beaches. The effects on coastal processes, marine organisms, abutting property, view plains, and public access will be negligible. The performance of beach stabilization structures will be monitored, analyzed, and documented. Any unintentional effects identified through monitoring will be addressed through structural modification, removal, or supplemental fill placement. The equilibrium toe of the restored and stabilized beach will remain within the historical extent of the beach. Structures may be constructed using mechanical systems.

Secondary actions included within the program to support primary actions detailed above are listed below:

- Construction, installation, and removal of temporary construction-related erosion protection, including but not limited to silt containment devices and sand bag revetments.
- Construction of temporary shore-parallel or shore-perpendicular dikes of variable length using existing or recovered beach sediments along shore to control the discharge of hydraulic fill and turbidity.
- Construction of nearshore submerged berms for the purposes of retaining adjacent subaerial beach.
- Planting vegetation to stabilize the beach with special conditions for types of vegetation and maintenance (DLNR, 2004).

2.2.3 Activities Categorically Excluded from the Program

Activities that are likely to have significant negative impacts on marine life, water quality, coastal processes, or shoreline access are categorically excluded from the program. This includes activities that are likely to result in the take of endangered, threatened, or otherwise protected species or are likely to result in significant damage to special aquatic sites such as wetlands, vegetated shallows, mudflats, coral reefs, and seagrass beds. Specific identified activities that are excluded from authorization or consideration under the program are those that utilize any of the following:

- Increasing project size beyond program limitations, as defined in Table 10, by constructing multiple projects within the same littoral cell.
- Long-term beach fill stockpiling for future projects. Dredging is limited to recovering the volume of beach compatible fill that will be used to construct the project (i.e. no additional fill may be placed or stockpiled for subsequent nourishment).
- Placement of any non-beach quality or compatible fill including, but not limited to, pulverized coral.
- Construction of new shoreline armoring structures (e.g. seawalls, revetments).
- Actions determined for any reason to have a significant adverse environmental or cultural impact.
- Actions that would cause extreme turbidity (as defined in Section 5.6), purposeful damage to live rock or coral, extreme eutrophication, or other long-term impairment to water quality.

2.2.4 Construction Methods

Either mechanical or hydraulic systems can be used to recover (dredge) beach fill from nearshore and offshore borrow areas (i.e. sand deposits used to nourish a beach). Mechanical systems could include the use of a barge-mounted excavator or crane and clamshell for beach fill recovery and a scow or deck barge for beach fill delivery. Hydraulic systems could include a suction pump with or without a slurry agitator, water jet, or cutterhead attachment for beach fill recovery and a pipeline for beach fill delivery. Moreover, considering the small-scale and opportunistic nature of these projects, it is anticipated that innovative hybrid systems (i.e. combined mechanical and hydraulic systems) could be used to recover and deliver beach fill; for example, an excavator could be used to recover sand that is delivered to the fill area via hydraulic pipeline. Dust pan and hopper (i.e. drag arm) type dredges are not anticipated due to surface irregularities, borrow area size, and distance between fill and borrow sites. The dredge type and sediment delivery system utilized will depend on many factors, including competition in the bid process, pumping or haul distance, wave conditions, bottom type, borrow site depth, and extent of dredging.

Once the material is delivered to the beach, onshore construction crews will shape the material into the desired construction template. The material is typically managed in a way that reduces turbidity by constructing temporary shore-parallel dikes along which the water from the slurry will run, allowing additional time for material to settle out of suspension before the seawater returns to the ocean. Temporary dewatering basins may be constructed to control turbidity, particularly for projects where temporary shore-parallel or shore-perpendicular dikes or other diversion measures cannot be constructed of sufficient length due to limited existing beach width or length to allow material to settle out of suspension before the seawater returns to the ocean. Equipment such as bulldozers and front-end-loaders are typically used to shape fill placed on the beach and move pipes as necessary. At the location where the submerged pipeline comes ashore, the slurry is typically diverted with a 90-degree elbow to direct the flow towards the project area. As portions of the project are constructed, the pipeline is extended to allow for the next section of beach to be constructed.

Beach stabilization structures are typically constructed using land-based operations, though marine-based operations are effective given suitable water depths and sheltered locations. Earth moving equipment necessary to prepare the foundation may include trucks, excavators, and bulldozers. Excavators, cranes, and clamshell buckets may be used to install marine mattress foundations, armor stone, place beach fill, and conduct ancillary operations necessary to construct and pre-fill beach stabilization structures. Temporary cofferdams and trestles may be used to support the construction of beach stabilization structures. Additional equipment would likely include fencing to enclose construction areas, survey equipment, and timber mats.

2.2.5 Explanation of the Program

The objective of the Small Scale Beach Restoration (SSBR) program is to help facilitate the process under which actions that contribute to the restoration and maintenance of beaches across the State of Hawaiʻi are permitted. The strategy is to develop a streamlined regulatory process by consolidating permitting and environmental review oversight under the DLNR with concurrence from the DOH, USACE, and CZM Program. The program, if effectuated, would involve the development of an interagency programmatic agreement, which will allow for a wide range of common beach restoration activities to be authorized through a single program. Although the program is not intended to include all permits, approvals, and/or concurrences required for the restoration and maintenance of beaches (e.g. County approvals, State Land easements), it will include the more complex and burdensome permits in an effort to streamline the process for community organizations (e.g. Erosion Prevention Districts, Homeowner Associations, etc.), private land owners, and governmental agencies so that they may focus energy and resources on the restoration and maintenance tasks at hand.

This proposed program covers five (5) permits or authorizations and is in compliance with seventeen (17) different state and federal laws that currently govern elements of beach management, maintenance, and restoration (as detailed in Section 1.3.1 and summarized in Table 9). The proposed program was carefully designed to save time and planning expenses. This program does not create any additional requirements for beach restoration.

Table 9. Beach Restoration Permits, Authorizations, and Laws

Action	Agency	Authority	Notes
Coastal Zone Management Consistency Determination	State of Hawai‘i Office of Planning, Coastal Zone Management Program	HRS § 205A-1 HRS § 205A-3 HRS § 225M-2	
Environmental Assessment / FONSI	Office of Environmental Quality Control	HRS § 343	
General Permit	U.S. Army Corps of Engineers	CWA § 404 CWA § 401 RHA § 10	Section 106 NHPA[1], Section 7 ESA, EFH, FWCA, MBTA[2], *NEPA compliance to be conducted by the USACE
Water Quality Certification	State of Hawai‘i Department of Health Clean Water Branch	CWA § 401 HRS § 342D	
Conservation District Use Application	State of Hawai‘i Department of Land and Natural Resources Office of Conservation and Coastal Lands	HRS § 183B HRS § 188-44	Board of Land and Natural Resources approval required

This program is not intended to incorporate county permits that may be required during the course of beach management, maintenance, or restoration, such as those needed for staging operations on fast land. While most of the actions to restore Hawai‘i beaches would involve the use of lands within the jurisdiction of state and federal agencies, this PEA may be used to support respective county actions, where applicable. Actions that are processed by the OCCL to manage, maintain, and restore beaches will continue to be reviewed by the respective county agencies through the active solicitation of their comments by OCCL. If the action to restore a Hawai‘i beach involves the construction of beach stabilization structures on submerged land, the applicant will be required to obtain an easement from the DLNR Land Division. OCCL also acknowledges that HRS Section 174C, the State Water Code, may apply and require permits for some beach restoration activities that include beneficial reuse of beach compatible fill recovered from a stream mouth; it is not the intent of the program to include these permits at this time. Additionally, it is entirely reasonable to assume that a range of other permits may become applicable in different small-scale beach restoration projects, due to the range and diversity of beach systems across the state and design variability; individual projects are likely to have individual needs. Again, it is not the intent of the program to cover all potential and possible permits that may be associated with small-scale beach

[1] Under § 106 of the NHPA, the USACE is the federal agency tasked with the responsibility of complying with this Section, as the federal nexus of this program is the issuance of a General Permit under § 404 of the CWA, § 401 of the CWA, and § 10 of the RHA. There has been some confusion as to which government agency is responsible for § 106 compliance under this action. Formal § 106 consultation shall be initiated with the appropriate agencies by the USACE Honolulu District Office upon receipt of a completed permit application from OCCL. Under this Section, the USACE and SHPO have the option to enter into a § 106 programmatic agreement. This programmatic agreement is then the interagency programmatic agreement (PA), which DLNR OCCL intends to enter into with other state and federal agencies for the purpose of implementing the program.

[2] Migratory Bird Treaty Act, 16 U.S.C. 703-712.

restoration, only to cover those most commonly required for management, maintenance, and restoration activities and/or those considered to be the greatest hindrances to restoration efforts. In the event that an individual project may require permits outside those covered under the program, the program, through the participating agencies and its community partners, will do its best to help individual applicants and projects navigate additional permits that may apply to an individual applicant's restoration activities.

As discussed in Section 1.3 and shown in Table 9, Hawai‘i beach restoration projects are governed by a complex range of federal, state, and local agencies. When implemented, the proposed program will create a process whereby small-scale beach restoration projects can obtain authorization under a series of laws and regulations using a single permit application. The program will be managed through DLNR OCCL. Upon receipt of a submitted permit application, OCCL will review the application for completeness and either acknowledge the submittal of a complete application or request additional information from the applicant. Once an applicant submits a complete application, OCCL will review the application and distribute it to additional resource agencies and advisory groups as necessary. Activities eligible for authorization under the program will be sorted into permit categories, with Category I representing the lowest level of authorized activity (minor activities) and Category III representing the highest level (moderate activities). The permit categories and review process are outlined in Table 10. All authorized activities will be subject to conditions proposed in this PEA, an Interagency Programmatic Agreement, a Statewide Conservation District Use Permit, and additional site-specific conditions imposed based on the permit category and information provided during the application process.

The permit categories referenced above and outlined in Table 10 include beach restoration activities detailed in Section 2.2.2. Beach management activities are included within Category I but are separated into Category IA and Category IB to account for differences associated with conducting operations above and below mean high water. Beach maintenance activities are included within Category II and Category III. Category II projects are limited to local beach maintenance activities, while Category III projects include littoral cell based beach maintenance activities. Phased projects (i.e. temporary beach stabilization demonstration structure replaced with a permanent beach stabilization structure) and maintenance based on design triggers (i.e. when the restored beach erodes into the design template) will be allowed under one permit as long as the size of the total project remains within program limitations.

Table 10. Small Scale Beach Restoration Project Permit Categories and Review Process

Category	Avoidance and Minimization Measures	Scope	Review Process
Category IA	General Conditions and BMPs Site-Specific Conditions	Beach Management Operations (i.e. sand pushing, backpassing, bypassing) above mean high water. Beach quality sand meeting compatibility criteria may be moved within the littoral cell from an area of beach accretion to an area of beach erosion to manage chronic and seasonal erosion hazards. The equilibrium toe of the restored beach will remain within the historical extent of the beach.	Upon review of completed application, OCCL issues permit that includes project-specific avoidance and minimization measures. OCCL provides notice to cooperating agencies.
Category IB	General Conditions and BMPs Site-Specific Conditions	Beach Management Operations (i.e. sand pushing, backpassing, bypassing, stream mouth clearing) above and below mean high water. Beach quality sand meeting compatibility criteria may be moved from an area of beach accretion to an area of beach erosion to manage chronic erosion and seasonal erosion hazards. The equilibrium toe of the restored beach will remain within the historical extent of the beach.	Upon receipt of completed application, OCCL forwards application to resource agencies as appropriate for 30-day review. Agencies can respond with one or more of the following: ▪ Request additional information; and/or ▪ Recommend additional site-specific conditions and BMPs Upon review of completed application and agency response, OCCL either requests additional information from the applicant or issues permit that includes project-specific avoidance and minimization measures. OCCL provides notice to cooperating agencies of findings and/or issuance of permit.
Category II	General Conditions and BMPs Site-Specific Conditions	Beach Maintenance Operations (i.e. beach nourishment) limited to 1,000 cubic yards. Beach quality fill meeting compatibility criteria for placement may come from nearshore and offshore waters, stream mouths, harbors, and upland sources to restore or nourish beaches and dunes. Recovery volume is limited to what can be placed in the beach fill template. The equilibrium toe of the restored beach will remain within the historical extent of the beach.	Upon receipt of completed application, OCCL forwards application to resource agencies as appropriate for 30-day review. Agencies can respond with one or more of the following: ▪ Request additional information; and/or ▪ Recommend additional site-specific conditions and BMPs Upon review of completed application and agency response, OCCL either requests additional information from the applicant or issues permit that includes project-specific avoidance and minimization measures. OCCL provides notice to cooperating agencies of findings and/or issuance of permit.
Category III	General Conditions and BMPs Site-Specific Conditions Project Performance Monitoring	Beach Maintenance Operations (i.e. beach nourishment) limited to 25,000 cubic yards. Beach quality fill meeting compatibility criteria for placement may come from nearshore and offshore waters, stream mouths, harbors, and upland sources to restore or nourish beaches and dunes. Recovery volume is limited to what can be placed in the beach fill template. Beach Stabilization Structures. The equilibrium toe of the restored beach will remain within the historical extent of the beach.	Upon receipt of completed application, OCCL forwards application to resource agencies as appropriate for 30-day review. Agencies can respond with one or more of the following: ▪ Request additional information; and/or ▪ Recommend additional site-specific conditions and BMPs; and/or ▪ Recommend additional project performance monitoring requirements Notice is published in OEQC bulletin for 30-day public review which is to coincide with a public meeting in the project area. Upon review of completed application and agency response, OCCL either requests additional information from the applicant or issues permit that includes project-specific avoidance and minimization measures. OCCL provides notice to cooperating agencies of findings and/or issuance of permit.
Not Covered		Beach Maintenance Operations (i.e. beach nourishment) that exceed 25,000 cubic yards. Activities that are likely to have significant negative impacts on marine life, water quality, coastal processes, or shoreline access. Activities that are likely to result in the take of endangered, threatened, or otherwise protected species, or significant damage to special aquatic sites such as wetlands, vegetated shallows, mudflats, coral reefs, and seagrass beds, or long-term significant impairment of coastal waters. Activities which may cause significant adverse impacts to cultural resources.	Upon review of completed application, OCCL notifies applicant that activities are outside program scope and that individual permits must be pursued. No notice is provided to cooperating agencies.

The first step towards implementing the SSBR program is the development of this PEA. The purpose of this PEA is to meet Chapter 343 requirements and to complete the application requirements for a statewide CDUP to authorize SSBR projects statewide. Moreover, it is intended that this PEA will be used to comply with environmental documentation requirements necessary to obtain federal permits and establish an interagency programmatic agreement. This PEA serves to evaluate the significance of potential environmental impacts that could result from SSBR projects statewide. Public review, hearings, and comments are part of this process.

2.3 Alternatives Eliminated from Further Evaluation

All reasonable alternatives must be considered "practicable" and serve to meet the project's purpose and need. An alternative is not considered practicable if:

- It does not meet the project purpose and need;
- Cost of construction (including mitigation) is excessive;
- There are severe operational or safety problems;
- There are unacceptable adverse social, economic, cultural, or environmental impacts;
- There would be serious community disruption;
- There are logical or technical constraints.

Although the "No Action" alternative (Alternative 1 – Status Quo) includes beach management, maintenance, and restoration; the purpose and need defined in Section 1 is not fully met as this alternative does not meet the need of providing a streamlined permitting approach. Therefore, the "No Action" alternative (Alternative 1) is not considered practicable according to the metrics defined above. However, it is included in the environmental assessment as it provides a necessary baseline and reference comparison for the environmental consequence evaluation.

Another alternative identified would only select a limited number of sites and beach systems for program eligibility. A limited site program would enable restoration of some beaches, while potentially and arbitrarily denying that opportunity to other beaches. Therefore, this alternative does not meet the project purpose and need and was not selected as an alternative to further evaluate as it was not considered practicable.

3 DESCRIPTION OF ENVIRONMENTAL SETTING

3.1 Physical Setting

The Hawaiian island chain spans more than 1,500 miles from Kure Atoll in the northwest to the island of Hawai'i at the extreme southeast end. The Northwestern Hawaiian Islands are the small islands and atolls located northwest of Kaua'i extending to Kure Atoll. There are eight islands that make up the "main" Hawaiian Islands, which are located along the southeast end of the island chain and occupy a narrow zone 430 miles long. Six of these islands are included in the geographic scope of this PEA and include Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawai'i. Together these six islands cover over 5,700 square miles (Table 11) (Western Regional Climate Center, 2018).

Table 11. Size and Extent of the Main Hawaiian Islands

Island	Length (miles)	Width (miles)	Area (square miles)
Hawaiʻi	93	76	4,021
Maui	48	26	728
Oʻahu	44	30	602
Kauaʻi	33	25	553
Molokaʻi	38	10	259
Lānaʻi	18	13	141

Kauaʻi is the westernmost of the six Main Hawaiian islands. The island is geologically the oldest of the main islands and is characterized by the Waimea Canyon in the western half of the island and by the broadly eroded valley lands in the eastern half. The easternmost island, Hawaiʻi, is geologically the youngest and includes two large mountain masses. These two mountains, Mauna Loa and Mauna Kea, are only slightly eroded and currently rise to over 13,000 feet above mean sea level. The four major islands lying between Kauaʻi and Hawaiʻi are intermediate in age and in the amount of erosion to which they have been subjected.

3.1.1 Climate

Nearly half of Hawaii's land lies within five miles of the coast and, therefore, the Pacific Ocean plays a significant role shaping the region's climate. Along with the marine influence, the mountains strongly modify the marine effect and result in climatic conditions of great diversity. In general, the Hawaiian Island chain is situated south of the large Eastern Pacific semi-permanent high-pressure cell which greatly affects air circulation in the region. This high-pressure cell produces very persistent northeasterly winds called the trade winds. During the winter months, cold fronts sweep across the north central Pacific Ocean, bringing rain to the Hawaiian Islands and intermittently modifying the trade wind regime. For most of Hawaiʻi, the climate can be generally characterized by two seasons: "summer", between May and September, and "winter", between October and April.

3.1.2 Temperature

Temperatures in Hawaiʻi at sea level generally range from highs of 85–90°F (29–32°C) during the summer months to 79–83°F (26–28°C) during the winter months. It is uncommon for temperatures to rise above 90°F (32°C) or drop below 65°F (18°C) at lower elevations. However, at higher elevations (i.e. at the three highest mountains of Mauna Kea, Mauna Loa, and Haleakalā), temperatures are generally much lower as they receive occasional snowfall during the winter. One distinctive feature of Hawaii's climate is the small annual variation in temperature range. Due to Hawaii's close proximity to the Equator and the fact that the islands lie within a narrow latitude band, there is only a slight variation in the length of night and day from one part of Hawaiʻi to another. The small variations in the length of the daylight period and the smaller annual variations in the altitude of the sun above the horizon result in relatively small variations in the amount of incoming solar energy from one time of the year to another.

The seasonal range of sea surface temperatures near Hawaiʻi is roughly six (6) degrees, from a low near 74°F (23°C) between late February and March to a high near 80°F (27°C) in late September or early October. The variation from night to day is one (1) or two (2) degrees.

3.1.3 Wind

The northeasterly trade wind is the prevailing wind throughout the year in Hawaiʻi. During the summer months, wind speeds over the ocean exceed 12 miles per hour 50% of the time. These winds originate from the northeast quandrant 80 to 95% of the time. During the winter months when trade winds are not quite as prevalent, wind speeds are in excess of 12 miles per hour about 40% of the time. Southerly or westerly "Kona" winds are generated by low pressure or cold fronts that typically move from west to east past the islands. It is during this winter season that light variable winds are most frequent. Winter is also the time of occasional very strong winds typically associated with passing storm fronts; however, strong winds also can occur in summer with infrequent tropical storms or hurricanes (Western Regional Climate Center, 2018).

3.1.4 Wave Conditions

Four general wave types typically characterize the wave climate in Hawaiʻi. These include northeast tradewind waves, southern swell, North Pacific swell, and Kona wind waves. The average directional wave spectrum in Hawaiian waters is bimodal and dominated by the North Pacific and trade wind swell regimes. The southern swell and Kona storm regimes do not occur with comparative magnitude and frequency as the North Pacific and trade wind swell regimes but are an important factor in seasonal beach dynamics on southern and western (leeward) coasts. Tropical storms and hurricanes also generate waves that can approach the islands from virtually any direction.

Tradewind waves occur throughout the year and are the most persistent during the months of April through September. Steady trade winds blowing from the northeast quadrant over long fetches of open-ocean are the cause of these waves that are generally between 3 and 8 feet (0.9 to 2.4 meters) high with periods of 5 to 10 seconds, though wave heights in excess of 15 feet and periods of 15 to 20 seconds do occur (Western Regional Climate Center, 2018). The direction of approach, like the trade winds themselves, varies between north-northeast and east-southeast and is centered on the east-northeast direction.

In the northern hemisphere, strong storms are frequent in the North Pacific in the mid latitudes and near the Aleutian Islands during the winter months. These storms generate large North Pacific swells ranging from 15 to 30 feet (4.6 to 9.2 meters) with long periods of 12 to 20 seconds originating from the west-northwest to northeast. These waves arrive at the northern Hawaiian shores with little attenuation of wave energy.

The waves most persistent during the summer months are the southern swells. These waves, with heights ranging from 8 to 10 feet (2.5 to 3 meters) and periods of 14 to 20 seconds, are generated by storms in the southern hemisphere and travel distances of up to 5,000 miles (Vitousek and Fletcher, 2008). Depending on the positions and tracks of the southern hemisphere storms, southern swells approach between the southeasterly and southwesterly directions.

Kona storm waves generally approach from the southwest and are typically 5 to 10 feet (1.5 to 3 meters) with a period ranging from 6 to 10 seconds. Deepwater wave heights during the severe Kona storm of January 1980, however, were much larger at approximately 17 feet (5.2 meters). These waves are infrequent, occurring only about 10% of the time during a typical year.

Along with the four major wave types observed within the marine waters of Hawaiʻi, tropical storms and hurricanes generate very large waves. These storms are caused by intense low pressure vortices that are usually spawned in the eastern tropical Pacific Ocean and travel westward. These storms typically pass south of the Hawaiian Islands; however, their paths are unpredictable and they occasionally pass near or over the Hawaiian Islands. In recent history, Hurricane Ewa (1982) and Hurricane Iniki (1992) directly hit the island of Kauaʻi and resulted in large waves along southern shores of Oʻahu. Damage from these hurricanes was extensive, not only on Kauaʻi, which was subject to both high winds and waves, but also along coastal areas of other islands exposed to the large waves. The most recent landfall of a tropical cyclone occurred in 2018 when Hurricane Olivia made landfall in northwest Maui as a minimal tropical storm and made a second landfall on the northeast coast of Lānaʻi.

Table 12. Recorded Tropical Cyclone Landfalls in Hawaiʻi

Name	Date	Category	Sustained Winds
"Seven"	August 8, 1958	Tropical Storm	50 mph (85 km/h)
Dot	August 6, 1959	Category 1 Hurricane	85 mph (140 km/h)
Raymond	October 20, 1963	Tropical Depression	30 mph (45 km/h)
Ewa	November 23, 1982	Category 1 Hurricane	90 mph (150 km/h)
Gilma	August 3, 1988	Tropical Depression	25 mph (40 km/h)
Iniki	September 11, 1992	Category 4 Hurricane	145 mph (230 km/h)
Orlene	September 14, 1992	Tropical Depression	30 mph (45 km/h)
Eugene	July 24, 1993	Tropical Depression	35 mph (55 km/h)
Iselle	August 8, 2014	Tropical Storm	60 mph (95 km/h)
Darby	July 24, 2016	Tropical Storm	40 mph (65 km/h)
Olivia	September 12, 2018	Tropical Storm	45 mph (75 km/h)

3.1.5 Tides, Water Levels, and Sea Level Rise

Hawaiʻi tides are semi-diurnal with pronounced diurnal inequalities (i.e. two high and low tides each 24-hour period with different elevations). The typical tidal range observed at the Main Hawaiian Islands can be characterized by the tide station located at Honolulu Harbor on Oʻahu. The mean tidal levels measured at this station, based on the 1983-2001 tidal epoch, includes a Mean High Water (MHW) level of 1.5 feet (0.45 meters) and a Mean Low Water (MLW) level of 0.2 feet (0.06 meters) referenced to the Mean Lower Low Water (MLLW) vertical datum, indicating a mean tidal range of approximately 1.3 feet (0.39 meters). The great diurnal tide range, or difference between Mean Higher High Water (MHHW) and Mean Lower Low Water (MLLW), measured at this station during the same tidal epoch is 1.9 feet (0.58 meters). Relative to the Mean Lower Low Water (MLLW) tidal datum, the highest observed water level of 99 cm (3.25 feet) was measured on August 21, 2017 (University of Hawai'i Sea Level Center, 2018) while the lowest observed water level of -43 cm (-1.41 feet) was measured on April 30, 1911 (NOAA Tides and Currents, 2018).

Typical water levels observed in Hawaiʻi can be significantly influenced and altered by astronomical, climatic, and meteorological factors throughout the year. One such factor is “king tides,” which are produced when the Earth, Moon and Sun are aligned at perigee and perihelion, resulting in the largest tidal range seen over the course of a year. Due to their astronomical nature, king tides are regular and predictable events that reoccur multiple times a year. Another factor influencing water levels involves changes in climactic conditions such as the onset of El Niño events. The El Niño Southern Oscillation (ENSO) is a recurring climate pattern involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean. On periods ranging from about three (3) to seven (7) years, the surface waters across a large swath of the tropical Pacific Ocean warm or cool by anywhere from 1°C to 3°C, compared to normal. In general, the onset of an El Niño event creates the presence of unusually warm water around the Hawaiian Islands. As cool water begins to warm, it expands and results in localized areas of elevated ocean surface heights. These elevated ocean surface heights during El Niño years create relatively higher water levels along the island's shorelines. In addition, meteorological events such as tropical storms and hurricanes also have the ability to influence water levels as a result of storm surge and storm tide. Storm surge is a rising of ocean water as a result of atmospheric pressure changes and wind associated with a storm. Storm tide is the water level rise during a storm due to the combination of storm surge and the astronomical tide.

Data from NOAA tide stations around Hawaiʻi show that observed water levels in 2016 and 2017 were 3 to 6 inches (7.6 to 15.2 centimeters) above predicted tidal heights (Sea Grant, 2017). In late August 2017, levels peaked at more than 10 inches (0.26 meters) above predicted tides at the Honolulu Harbor tide gauge, resulting in the highest daily mean water level ever observed over the 112-year record, according to UHSLC. The combination of elevated water levels, seasonally high tides, and a large south shore surf event also resulted in coastal flooding on April 28, 2017 in low-lying shoreline areas in Honolulu and elsewhere (Sea Grant, 2017). In general, persistent high water levels result in coastal erosion, wave overwash, and temporary nuisance flooding in low-lying areas and around storm drain systems (Figure 1). Impacts may be more severe when king tides occur during an El Niño year or if they coincide with a coastal storm or high surf events.

Figure 1. High sea levels following a king tide event in Waikiki in 2017. Photos courtesy of the University of Hawai'i News

Global sea level rise (SLR), caused primarily by melting continental glaciers and ice sheets and expansion of the ocean waters with warming, is another major factor that is influencing water levels surrounding the Hawaiian Islands. The present rate of Global Mean Sea Level (GMSL) rise has accelerated from 1.7 mm/year throughout much of the twentieth century to 3.2 mm/year since the 1990s (Climate.gov). Local relative sea level rise is observed in tide gauges around Hawai'i, as shown in Figure 2, but the rate of rise is locally variable due to varying rates of geologic subsidence among the islands, as well as climatic and oceanic variability (tidesandcurrents.noaa.gov). Recent climate research by the Intergovernmental Panel on Climate Change (IPCC) predicts continued or accelerated global warming for the 21st Century and possibly beyond, which will cause an accelerated rise in global mean sea level (USACE, 2009). The U.S. Global Change Research Program finds that GMSL is very likely (90 to 100% confidence) to rise by 0.3 to 0.6 feet (0.09 to 0.18 meters) by 2030, 0.5 to 1.2 feet (0.15 to 0.38 meters) by 2050, and 1.0 to 4.3 feet (0.30 to 1.3 meters) by 2100 (USGCRP, 2017). A 2017 report from the National Oceanic and Atmospheric Administration (Sweet et al., 2017) finds that emerging science regarding Antarctic ice sheet stability points to a "physically plausible" GMSL rise exceeding 8 feet (2.4 m) by 2100 under high greenhouse gas emission scenarios and worst-case scenario for ice sheet and glacier melt. Regardless of pathway, it is extremely likely (95 to 100% confidence) that SLR will continue beyond 2100 (USGCRP, 2017).

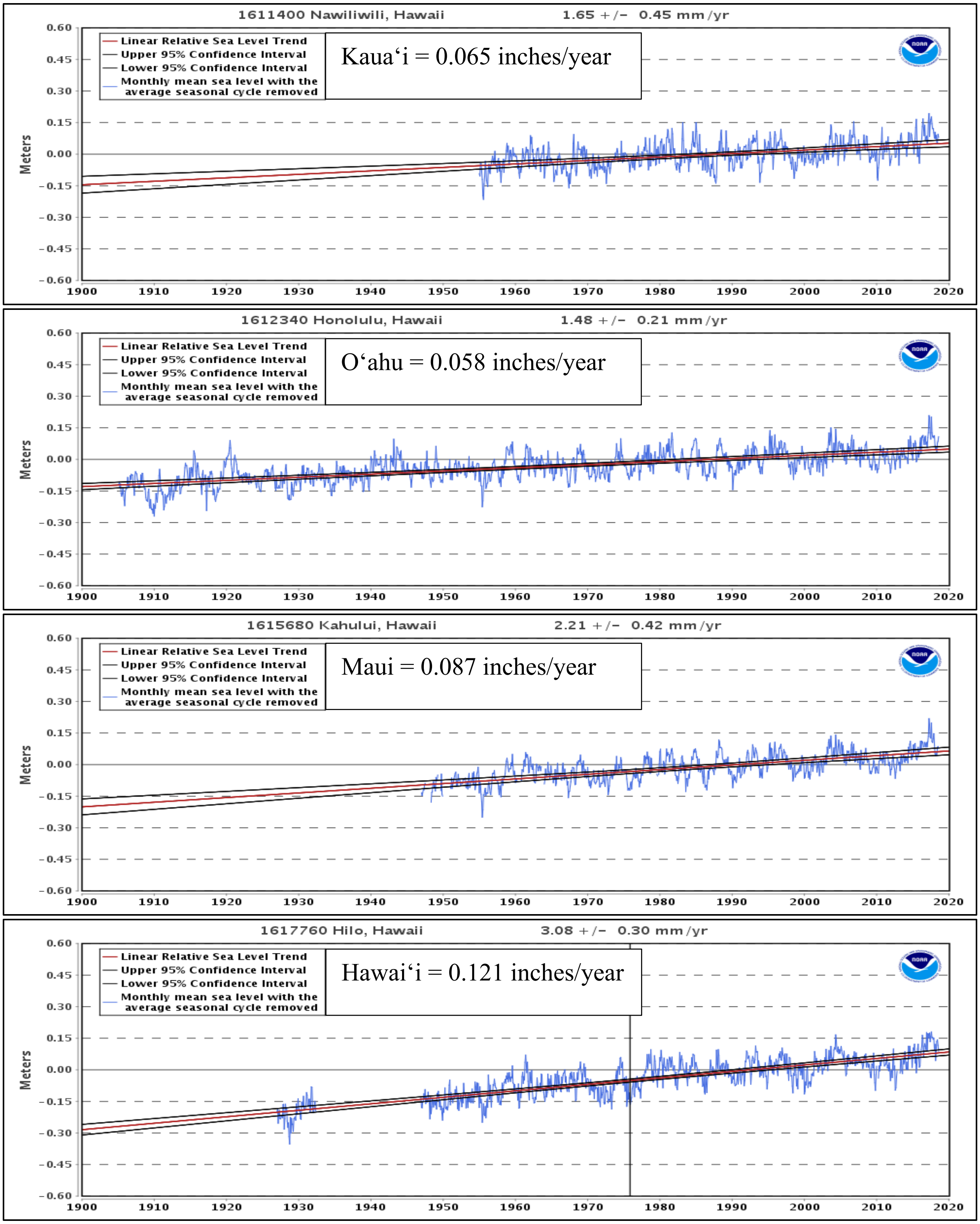

Figure 2. Mean Sea Level Trend for the Hawaiʻi Tide Stations

The recently completed Hawai‘i Sea Level Rise Vulnerability and Adaptation Report (DLNR, 2017) presents the most recent sea level rise science, introduces models used and results employed to evaluate sea level rise vulnerability across the state, and concludes with recommendations for planning, management, and adaptation to hazards associated with increasing sea level rise. Considering the importance of sea level rise across the State of Hawai‘i, especially as it relates to the need for this proposed program, additional sea level rise data and information are presented in Section 1.1.3 to describe the outlook for Hawai‘i beaches.

3.1.6 Noise

The maximum permissible sound levels within the State of Hawai‘i have been established and codified within Hawai‘i Administrative Rules §11-46. These rules provide for the prevention, control, and abatement of noise pollution in the State from stationary noise sources and from equipment related to agricultural, construction, and industrial activities. The standards are also intended to protect public health and welfare, and to prevent the significant degradation of the environment and quality of life. The rule sets forth several “zoning districts” which contain varying maximum noise limits expressed in decibels (dBA). The Class A zoning district includes all areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar type. Class B zoning districts include all areas equivalent to lands zoned for multi-family dwellings, apartments, business, commercial, hotel, resort, or similar type. Class C zoning districts include all areas equivalent to lands zoned agricultural, country, industrial, or similar type. The maximum permissible sound levels specified in Table 13 applies to the following excessive noise sources: stationary noise sources and equipment related to agricultural, construction, and individual activities.

Table 13. Maximum Permissible Sounds (levels in dBA)

Zoning District	Daytime (7am to 10pm)	Nighttime (10 pm to 7 am)
Class A	55	45
Class B	60	50
Class C	70	70

The existing noise levels at Hawaii’s beaches can vary depending on their location and time of day or night. For example, due to surf, traffic, on-going maintenance and use of construction equipment, the sound levels along Waikīkī Beach are often relatively high (55 to 60 dBA). Beach areas in proximity to significant construction activity may experience higher noise levels intermittently reaching 80 dBA (Sea Engineering, 2010). Other beaches along the Main Hawaiian Islands experience significantly less noise as they are situated in less populated areas.

3.1.7 Air Quality

The U.S. Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) to protect public health and welfare from harmful effects of certain commonly occurring pollutants known as “criteria” pollutants. The EPA requires that states monitor the ambient air to determine attainment of the NAAQS to regulate industries that emit these and other pollutants. Two types of standards have been established: Primary and Secondary standards. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, which includes protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The State of Hawaiʻi has also adopted ambient air quality standards for some pollutants and is codified within Chapter 11-59 of the Hawaiʻi Administrative Rules. In some cases, these are more stringent than the federal standards. At present, the state has set standards for six of the seven criteria pollutants (excluding $PM_{2.5}$) in addition to hydrogen sulfide (DOH, 2017).

Ambient Air Quality Standards

Air Pollutant	Hawaii Standard	Federal Primary Standard	Federal Secondary Standard
Carbon Monoxide			
1-hour average	9 ppm	35 ppm	None
8-hour average	4.4 ppm	9 ppm	None
Lead			
3-month average	1.5 µg/m^3 (calendar quarter)	0.15 µg/m^3 (running 3-month)	Same as primary
Nitrogen Dioxide			
1-hour average	None	100 ppb	None
Annual average	0.04 ppm	0.053 ppm	Same as primary
Particulate Matter (PM_{10})			
24-hour block average	150 µg/m^3	150 µg/m^3	Same as primary
Annual average	50 µg/m^3	None	None
Particulate Matter ($PM_{2.5}$)			
24-hour block average	None	35 µg/m^3	Same as primary
Annual average	None	15 µg/m^3	Same as primary
Ozone			
8-hour rolling average	0.08 ppm	0.075 ppm	Same as primary
Sulfur Dioxide			
1-hour average	None	75 ppb	None
3-hour block average	0.5 ppm	-	0.5 ppm
24-hour block average	0.14 ppm	0.14 ppm	-
Annual average	0.03 ppm	0.03 ppm	-
Hydrogen Sulfide			
1-hour average	25 ppb	None	None

ppb = parts per billion by volume
ppm = parts per million by volume
µg/m^3 = micrograms per cubic meter of air

Figure 3. Federal and State Ambient Air Quality Standards

The Department of Health's Clean Air Branch monitors air quality on a continuous basis via a network of stationary air quality monitoring stations located throughout the state. The primary purpose of the monitoring network is to measure ambient air concentrations for the criteria

NAAQS pollutants. The Clean Air Branch monitoring data collected during 2016 indicated that air quality in the area during this year never exceeded the short-term or long-term state or national standards for the various pollutants measured, which includes particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2) sulfur dioxide (SO_2), carbon monoxide, and hydrogen sulfide. As such, the air quality within the state, including areas near its beaches, are considered to be excellent.

3.1.8 Water Quality

The maintenance of good water quality in Hawai'i is vital to public health, Native Hawaiian cultural practices, leisure and recreation, food resources, research, and technology (Department of Health, 2015). In addition, clean streams and coastal waters are essential to Hawaii's most important economic industry: tourism. Hawaii's aquatic environment is one of the main reasons the state receives over eight million visitors annually (Hawai'i Tourism Authority, 2014). Swimming, surfing, snorkeling, boating, and other forms of water-based recreation are important aspects of tourism in Hawai'i. Therefore, water pollution that damages coral reefs and other marine ecosystems not only negatively affects marine life and coastal resilience, but can also have a significant negative effect on the state's economy. As such, the maintenance of good water quality within Hawaii's coastal waters is essential.

Poor water quality can originate through both point source and non-point source pollution. A point source is a single, identifiable source of pollution, such as a pipe or a drain. Industrial wastes are commonly discharged to rivers and the sea in this way. Non-point sources of pollution are often termed 'diffuse' pollution and refer to those inputs and effects which occur over a wide area and are not easily attributed to a single source. They are often associated with particular land uses, as opposed to individual point source discharges. In Hawai'i, land-based activities are the primary source of non-point source pollution statewide. Conventional land-based pollutants include sediment, nutrients, and pathogens, as well as toxic chemicals (Department of Health, 2015). Sediment from soil erosion and human and animal disturbances can increase the turbidity of coastal waters and threaten aquatic ecosystems, especially highly sensitive coral reefs. Nutrients from fertilizers, detergents, and sewage can be washed into coastal waters and lead to eutrophication, which can impact biodiversity, fisheries, and recreation. Furthermore, pathogens from human and animal fecal material in streams and beaches can pose risks to human health. Wastewater from Hawaii's cesspools and other wastewater systems can also contribute to both pathogen and nutrient runoff. As a result of these threats to water quality, the state maintains a robust program to monitor the condition of its inland and coastal waters.

Hawaii's nearshore water quality is monitored by the Department of Health's Clean Water Branch (CWB). The mission of the CWB is to protect the health of residents and tourists who recreate in and on Hawaii's coastal and inland water resources, and to also protect and restore inland and coastal waters for marine life and wildlife. The mission is to be accomplished through statewide coastal water surveillance and watershed-based environmental management using permit issuance, monitoring, enforcement, sponsorship of polluted runoff control projects, and public education. The CWB's Monitoring Section serves to identify sources of water pollution through area surveillance, routine inspections, and complaint investigations. This program is funded in part by the EPA's Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000. The BEACH Act helps states and local governments develop monitoring programs to protect public health. Through this program, the CWB Monitoring Section tests beach water for bacteria and issues closings or advisories when bacteria levels exceed a certain threshold.

The CWB Monitoring Section currently visits a network of monitoring sites on the islands of Kauaʻi, Oʻahu, Maui, Molokaʻi, Lānaʻi, and Hawaiʻi. Currently, there are approximately 490 BEACH Act beaches in the state, 125 of which were monitored in 2016 (Hawaiʻi Beach Monitoring Program, 2017). These sites are monitored to determine if water quality conditions support public health while recreating in and on the water (recreational health) and ecosystem health.

Recreational health is assessed by enumerating *enterococci*, the recommended EPA fecal indicator bacteria for coastal recreational waters. The presence of *enterococci* in sufficient numbers "indicates the potential for human infectious diseases" as defined in the Clean Water Act §502(23) (U.S. EPA Office of Water, 2012). Exceedance of the Water Quality Standard (WQS) for *enterococci* is generally thought to indicate the presence of human fecal contamination and, hence, the presence of pathogens. Hawaii's recreational water quality standards specify that *enterococci* content (magnitude) in recreational waters may not exceed a geometric mean of 35 colony forming units (CFU)/100 mL over any 30-day period (duration). In addition, a Statistical Threshold Value (STV) of 130 CFU/100 mL may not be exceeded by more than ten percent of samples taken within the same 30-day period (frequency). The CWB has developed a beach program decision rule to help guide actions necessary to provide appropriate notification to the public when monitoring shows that beach waters do not meet recreational water quality standards. The decision specifies a "Beach Action Value" (BAV), the level of indicator bacteria at which the CWB will take appropriate beach management actions. The CWB uses *enterococci* levels above 130 CFUs/100 mL as the BAV. Only a single exceedance of the BAV necessitates the CWB to take immediate actions and notify the public.

Ecosystem health is assessed by comparing nutrients and other parameters to the applicable water quality criteria. The nutrient parameters collected by the CWB includes total nitrogen (TN), nitrate+nitrite-nitrogen (NO_3+NO_2), ammonium-nitrogen (NH_4), total phosphorus (TP), and total dissolved nitrogen (TDN), and where applicable, total dissolved phosphorus (TDP), orthophosphate (PO_4), NO_3+NO_2 and NH_4 (HAR Ch. 11-54-6(d)). Other parameters collected for assessment purposes include chlorophyll-*a*, total suspended solids (TSS), and field parameters such as pH, temperature, turbidity, salinity, and conductivity.

In 2016, 50 of the 55 marine water bodies assessed by the CWB did not attain WQS for at least one or more conventional pollutants. It should be noted that not all parameters are assessed for every water body due to unavailability of new data. Across the state, chlorophyll-*a* WQS were exceeded most frequently (60%), followed by turbidity (50%) and nutrients (29%) in assessed marine water bodies. Attainment of the *enterococci* bacteria (the recreational health parameter) was observed in 96% of water body assessments (Table 14). Assessed marine water bodies on Kauaʻi, Oʻahu, Lānaʻi, and Hawaiʻi have the highest attainment of nutrient WQS (81%, 95%, 75%, and 53%, respectively), while only 40% of Maui's assessed marine waterbodies attain numeric WQS for at least one or more nutrients. On Kauaʻi, Oʻahu, and Maui, 100%, 92%, and 50% of assessed water bodies attain turbidity WQS, respectively. Assessed water bodies on Lānaʻi and Hawaiʻi indicate non-attainment of turbidity WQS (100% and 70%, respectively). Attainment of chlorophyll-*a* WQS is identified in 69% of marine water bodies assessed on the island of Hawai‘i. Most of the assessed water bodies on Kaua‘i, O‘ahu, Lāna‘i, and Maui do not attain chlorophyll-*a* WQS (100%, 69%, 100%, and 80%, respectively). As stated above, attainment of bacterial WQS accounts for over 96% of marine water bodies assessed on Kaua‘i, O‘ahu, and Hawai‘i (100%, 100%, and 94%, respectively) (Hawai‘i State Department of Health Clean Water Branch, 2017).

Table 14. Assessed marine water body attainment (A) and non-attainment (N) of WQS for pollutants summarized by island in 2016.

Island	Total Assessed Water Bodies	Bacteria		Nutrients		Turbidity		Chlorophyll *a*	
		A	N	A	N	A	N	A	N
Kaua‘i	4	1	0	13	3	2	0	0	3
O‘ahu	15	5	0	52	3	12	1	4	9
Moloka‘i	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lāna‘i	1	N/A	N/A	3	1	0	1	0	1
Maui	5	N/A	N/A	8	12	2	2	1	4
Hawai‘i	30	17	1	25	22	9	21	9	4
Total	**55**	**23**	**1**	**101**	**41**	**25**	**25**	**14**	**21**

3.2 Biological Setting

3.2.1 Endangered and Threatened Species

The endangered and threatened species of the Hawaiian archipelago are managed by the Protected Resources Division (PRD) of NOAA's National Marine Fisheries Service (NMFS) Pacific Island Regional Office (PIRO) and the U.S Fish and Wildlife Service's (USFWS) Pacific Islands Fish and Wildlife Office (PIFWO). The protected marine species and critical habitat present on the six Main Hawaiian Islands under NMFS-PRD's jurisdiction includes 29 marine mammals, 5 sea turtles, 2 fish, and 1 designated critical habitat area. The ESA defines "critical habitat" as the specific areas within the geographical area occupied by the species at the time it is listed that contain the physical or biological features essential to the conservation of the species and which may require special management consideration or protection. It may also include areas that were not occupied by the species at the time of listing but are essential for the conservation of the species. Of the 29 marine mammals, 7 are listed as endangered under the Endangered Species Act (ESA); however, all are protected under the Marine Mammal Protection Act (MMPA). All 5 sea turtle species are listed as either threatened or endangered under the ESA and the 2 fish species are proposed for listing as threatened. Critical habitat is designated for the endangered Hawaiian monk seal. There are currently no known ESA-listed coral species found in the Hawaiian archipelago. A list of protected terrestrial species and critical habitat of the Main Hawaiian Islands under USFWS jurisdiction includes 34 species of mammals, reptiles, birds, insects, crustaceans, and plants, and designated critical habitat for 19 species. Critical habitat is designated for 1 insect, 1 arachnid, 1 crustacean, and 16 plant species.

The marine and terrestrial species protected under the ESA and critical habitat that may occur in the proposed project areas include 2 sea turtles, 2 marine mammals, 1 fish, 2 birds, 5 insects, and 11 plants, as well as critical habitat for 1 marine mammal and 6 plants. These species and critical habitat are detailed in Table 15.

Table 15. Protected species and critical habitat that may occur in the proposed project areas (NMFS, 2017a, USFWS, 2017).

Common Name	Hawaiian Name	Scientific Name	ESA Listing
Reptiles			
Green Turtle, Central North Pacific DPS	Honu	*Chelonia mydas*	Threatened
Hawksbill Turtle	Honu'ea	*Eretmochelys imbricata*	Endangered
Marine Mammals			
False Killer Whale - Hawaiian Insular	N/A	*Pseudorca crassidens*	Endangered
Hawaiian Monk Seal	Liio holo I ka uaua	*Neomonachus schauinslandi*	Endangered
Fish			
Giant Manta Ray	Hāhālua	*Manta birostris*	Threatened (Proposed)
Birds			
Band-Rumped Storm-Petrel	Akēʻakē	*Oceanodroma castro*	Endangered
Newell's Shearwater	ʻAʻo	*Puffinus auricularis newelli*	Threatened
Insects			
Yellow-faced bee	Nalo meli maoli	*Hylaeus anthracinus*	Endangered
Yellow-faced bee	Nalo meli maoli	*H. assimulans*	Endangered
Yellow-faced bee	Nalo meli maoli	*H. facilis*	Endangered
Yellow-faced bee	Nalo meli maoli	*H. hilaris*	Endangered
Yellow-faced bee	Nalo meli maoli	*H. longiceps*	Endangered
Plants			
Maui Chaff Flower	ʻEwa hinahina	*Achyranthes splendens* var. *rotundata*	Endangered
Coastal Sandmat	Koko	*Chamaesyce skottsbergii var. skottsbergii*	Endangered
N/A	ʻAkoko	*Euphorbia* (*Chamaesyce*) *celastroides* var. *kaenana*	Endangered
Hawiian Hibiscus	Maʻo hau hele	*Hibiscus brackenridgei subsp. Brackenridgei*	Endangered
Hilo Murainagrass	Hilo ischaemum	*Ischaemum byrone*	Endangered
Hairy Purslane	ʻIhi	*Portulaca villosa*	Endangered
N/A	ʻEnaʻena	*Pseudognaphalium sandwicensium* var. *Molokaiense*	Endangered
Dwarf naupaka	Naupaka	*Scaevola coriacea*	Endangered
Lavaslope Centaury	ʻĀwiwi	*Schenkia* (*Centaurium*) *sebaeoides*	Endangered
Oahu Riverhemp	ʻŌhai	*Sesbania tomentosa*	Endangered
Nelson's Horsenettle	Popolo	*Solanum nelsonii*	Endangered
Critical Habitat			
Hawaiian monk seal		*Neomonachus schauinslandi*	Endangered
Maui Chaff Flower	ʻEwa hinahina	*Achyranthes splendens* var. *rotundata*	Endangered
N/A	ʻAkoko	*Euphorbia* (*Chamaesyce*) *celastroides var. kaenana*	Endangered
Hawaiian Hibiscus	Maʻo hau hele	*Hibiscus brackenridgei* subsp. *Brackenridgei*	Endangered
Hilo Murainagrass	Hilo ischaemum	*Ischaemum byrone*	Endangered
Lavaslope Centaury	ʻĀwiwi	*Schenkia* (*Centaurium*) *sebaeoides*	Endangered
Oahu Riverhemp	ʻŌhai	*Sesbania tomentosa*	Endangered

3.2.1.1 Reptiles

3.2.1.1.1 Green Sea Turtle (Central North Pacific DPS)

The green sea turtle (*Chelonia mydas*) was federally listed as a protected species on July 28, 1978 (43 FR 32800) under the ESA. In this initial listing, breeding populations of the green sea turtle in Florida and along the Pacific Coast of Mexico were listed as endangered; all other populations were listed as threatened. On April 6, 2016, NMFS and USFWS issued a final rule to list 11 distinct population segments (DPS) based on the best available scientific and commercial data (81 FR 20058). Under this rule, three DPSs are endangered species (Mediterranean, Central West Pacific, and Central South Pacific) and eight DPSs are threatened species (North Atlantic, South Atlantic, Southwest Indian, North Indian, East Indian-West Pacific, Southwest Pacific, Central North Pacific, and East Pacific). The threatened Central North Pacific DPS includes Hawaiʻi and Johnston Atoll. Green sea turtles are protected under the ESA and Hawaiʻi state law.

Green sea turtles are the largest of all the hard-shelled sea turtles but have a comparatively small head. While hatchlings are typically just 50 mm (2 in) long, adults can grow to more than 0.91 m (3 ft) long and weigh 136-159 kg (200-500 lbs) (NMFS, 2017b). Characteristics that distinguish the green turtle from other marine turtle species include four pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes (NMFS and USFWS, 1991). A green turtle's carapace is smooth and can be shades of black, gray, green, brown, and yellow. Their plastron is yellowish white. Hatchlings are distinctively black on the dorsal carapace and white on the ventral plastron. Adult green turtles differ from other sea turtles in that they are primarily herbivorous, feeding mostly on seagrass and algae. This diet is thought to give them greenish colored fat, from which they take their name (NMFS and USFWS, 1991). The eastern Pacific green sea turtles tend to have a higher percentage of animal prey in their diet such as jellyfish, salps, mollusks, sponges, and tubeworms than other populations (NMFS, 2017b).

Green sea turtles are the most common species of sea turtle in Hawaiʻi and they primarily nest in the French Frigate Shoals of the Northwestern Hawaiian Islands from late April through September, with peak season from June to July (USFWS, 2016). However, limited nesting has been observed on other islands and atolls of the Northwestern Hawaiian Islands and in low, but increasing, numbers in some locations in the Main Hawaiian Islands. Green sea turtles primarily feed in the coastal areas of the Main Hawaiian Islands (NFMS, 2017b).

The primary threat to green sea turtles in Hawaiʻi is disease, particularly fibropapillomatosis, which is characterized by the development of multiple tumors on the skin and internal organs. The tumors may interfere with swimming, eating, breathing, vision, and reproduction, which, if grown large enough, can be fatal (NMFS and USFWS, 1991; 2007). The current threats to green sea turtles include loss or degradation of nesting habitat from increased human presence, coastal development, and beach erosion. Sea level rise resulting from climate change may increase practices to fortify the coast, further exacerbating the problem (NMFS and USFWS, 2013). Additional threats include harvesting (mainly for jewelry), incidental take in fisheries, ingestion of marine debris, entanglement, nest and hatchling predations, and accidental nearshore fishery interaction (NMFS, 2017b). Successful protection of Hawaiian green turtles over the past 25 years has significantly decreased the harvesting of this species.

In 1998, NMFS designated critical habitat for the green sea turtle to include the coastal waters around Culebra Island, Puerto Rico (63 FR 46693). There is no green sea turtle marine or terrestrial critical habitat in the vicinity of the proposed project areas.

3.2.1.1.2 Hawksbill Sea Turtle

The hawksbill sea turtle (*Eretmochelys imbricata*) was listed as an endangered species on June 2, 1970 (35 FR 8491). They are also protected under Hawaiʻi state law and by the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). In addition, the International Union for the Conservation of Nature and Natural Resources (IUCN) listed hawksbill sea turtles as endangered in 1968 and elevated their status to critically endangered in 1996 (NMFS, 2017c).

The hawksbill sea turtle is small to medium-sized compared to other sea turtle species. Adults weigh 45-68 kg (100-150 lbs) on average but can grow as large as 91 kg (200 lbs). Hatchlings weigh about 14 g (0.5 oz). The carapace of an adult ranges from 63-90 cm (25-35 in) in length and has a tortoiseshell coloring, ranging from dark to golden brown with streaks of orange, red, and/or black. The shells of hatchlings are about 42 mm (1-2 in) long and are mostly brown and somewhat heart-shaped. The plastron is clear yellow. The hawksbill turtle's head is elongated and tapers to a point, with a beak-like mouth that gives the species its name. The shape of the mouth allows the hawksbill turtle to reach into holes and crevices of coral reefs to find invertebrate prey including sponges, their primary food source as adults. Hawksbill turtles are unique among sea turtles in that they have two pairs of prefrontal scales on the top of the head and each of their flippers usually has two claws (NMFS, 2017c).

This species is most commonly associated with healthy coral reefs and is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. In the Hawaiian Archipelago, hawksbill sea turtles mainly nest on the Island of Hawaiʻi, yet each year a few females nest on Maui and Molokaʻi. Nesting occurs from late May through November, with peak nesting from late July to early September (DLNR DOFAW, 2018; NMFS and USFWS, 1998). Through the use of satellite tags, the Hāmākua Coast of Hawaiʻi has been identified as a primary feeding ground for the species (NMFS, 2017c).

Like other species of sea turtles, the current threats to hawksbills include loss or degradation of nesting habitat from increased human presence, coastal development, and beach erosion. These factors may directly or indirectly serve to decrease the amount of nesting area available to nesting females and may evoke a change in the natural behaviors of adults and hatchlings. Sea level rise resulting from climate change may increase practices to fortify the coast, further exacerbating the problem (NMFS and USFWS, 2013). Artificial lighting along the coast also presents a threat to hawksbill sea turtles. The presence of lights on or adjacent to nesting beaches alters the behavior of nesting adults and is often fatal to emerging hatchlings as they are attracted to light sources and drawn away from the water or may even cause them to change course offshore.

Additional threats to hawksbills include nest predation by introduced species, tourism development, and direct harvest of adult turtles, which still occurs in some of the Pacific islands region, primarily for jewelry to sell to tourists.

Critical habitat for the hawksbill sea turtle has been designated in coastal waters surrounding Mona and Monito Islands, Puerto Rico (63 FR 46693). There is no hawksbill marine or terrestrial critical habitat in the vicinity of the proposed project areas.

3.2.1.2 Marine Mammals

3.2.1.2.1 Hawaiian Monk Seal (and Critical Habitat)

Hawaiian monk seals (*Neomonachus schauinslandi*) are endemic to Hawaiʻi and were listed as endangered under the ESA on November 23, 1976 (41 FR 51611). They are protected under the MMPA and Hawaiʻi state law (they are the official state mammal) and are one of the most endangered species in the world. To date, approximately 1,100 seals are left in the Northwest Hawaiian Islands and approximately 300 are left in the main Hawaiian Islands, and their overall population is in decline (NMFS, 2017d).

The Hawaiian monk seal can grow to approximately 1.8-2 m (6-7 ft) long and weigh 180-270 kg (400-600 lbs). Coloration varies from pup to adult stages, as pups are black and adults are dark gray to brown on their back and light gray to yellowish brown on their belly. They also shed the top layer of their skin and fur approximately once a year, known as a “catastrophic molt”. Their diet consists of squid, octopus, crustaceans, eel, and various fish and they are considered generalist feeders and prefer prey that is easier to catch. Hawaiian monk seals can dive up to 457 m (1,500 ft) but tend to keep their dives under 61 m (200 ft) to forage along the sea floor. These dives can last up to 20 minutes yet are typically around 6 minutes in length (NMFS, 2017d).

Distribution of the seals varies within the archipelago. Overall, more individuals inhabit the Northwestern Hawaiian Islands and data suggests that the number of seals is stabilizing in this region despite a 4% annual population decline from 1998 to 2006. This decline has been attributed to the limited prey availability. In the Main Hawaiian Islands, increased sightings and pups born suggests that the population may be increasing in this region. Although this increase is a positive trend for the species, it also presents challenges from a management standpoint. An increased presence of seals also leads to an increased chance of human-seal interaction and essentially disturbance to the animals. Human disturbance is the main threat to monk seals in the Main Hawaiian Islands. In the Northwestern Hawaiian Islands, the primary threats are starvation, shark predation on pups at one atoll, and aggressive male seals attacking other seals. Threats affecting both regions include entanglement in marine debris and fishing gear, habitat loss due to climate change and human development, and infectious disease and biotoxins (NMFS, 2017d).

The critical habitat for the Hawaiian monk seal was originally designated in 1986 (51 FR 16047) by NMFS and was revised in 2015 (80 FR 50925) to expand and include 16 occupied areas within the range of the species. These areas contain one or a combination of the features essential to the Hawaiian monk seal conservation including: (1) preferred pupping and nursing grounds, (2) significant haul-out areas, and (3) marine foraging areas out to the 200 m (650 ft) isobath. The

Main Hawaiian Islands Hawaiian monk seal critical habitat includes the seafloor and marine habitat to 10 m (32 ft) above the seafloor from the 200 m (650 ft) isobath through the shoreline and extending into terrestrial habitat 5 m (16 ft) inland from the shoreline between identified boundary points around the islands of Ka'ula, Ni'ihau, Kaua'i, O'ahu, Maui Nui (including Kaho'olawe, Maui, and Moloka'i), and Hawai'i (NMFS, 2017e). Figure 4 through Figure 7 display the critical habitat areas around the six Main Hawaiian Islands addressed in this PEA.

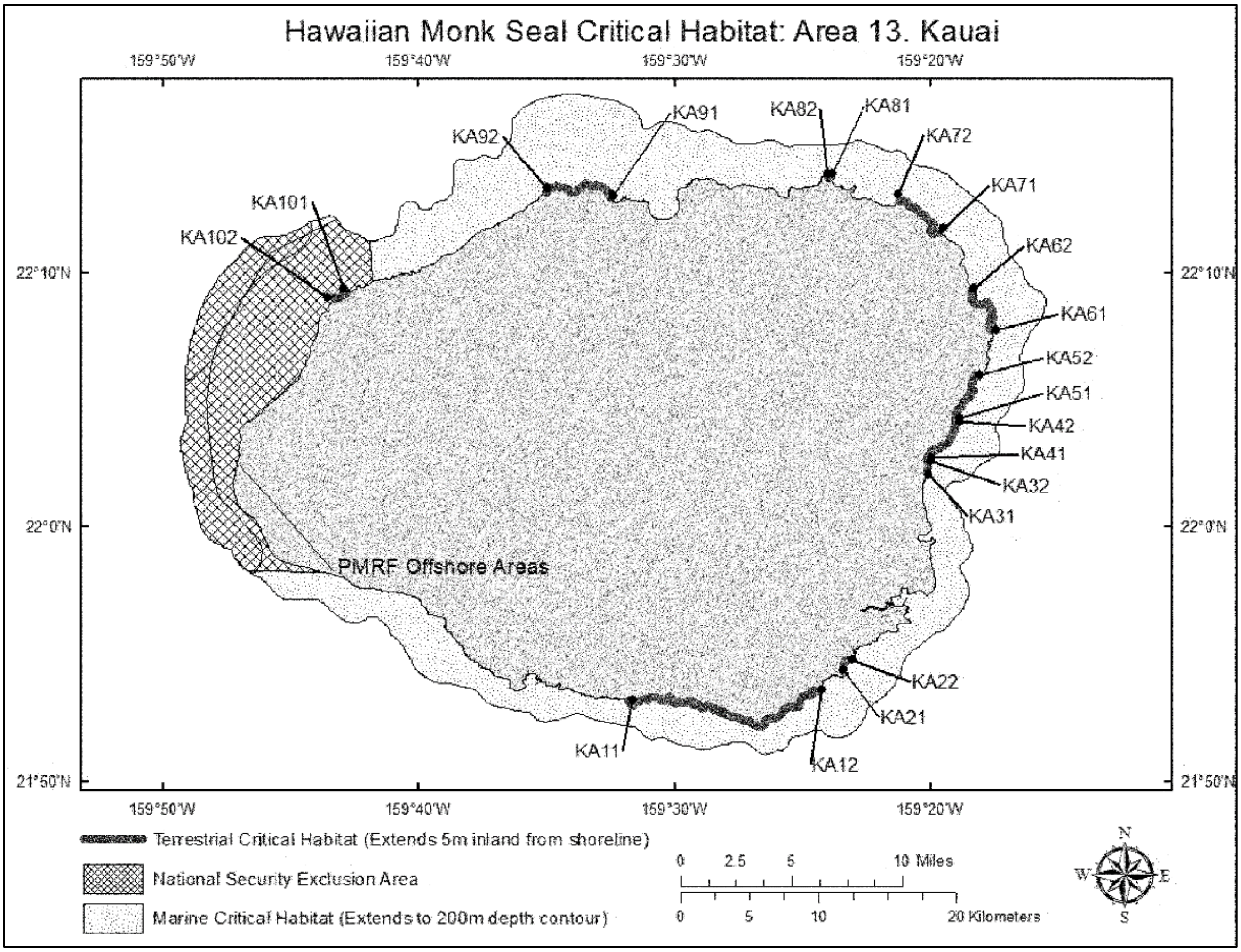

Figure 4. Designated Hawaiian monk seal critical habitat around Kaua'i (NOAA, 2015).

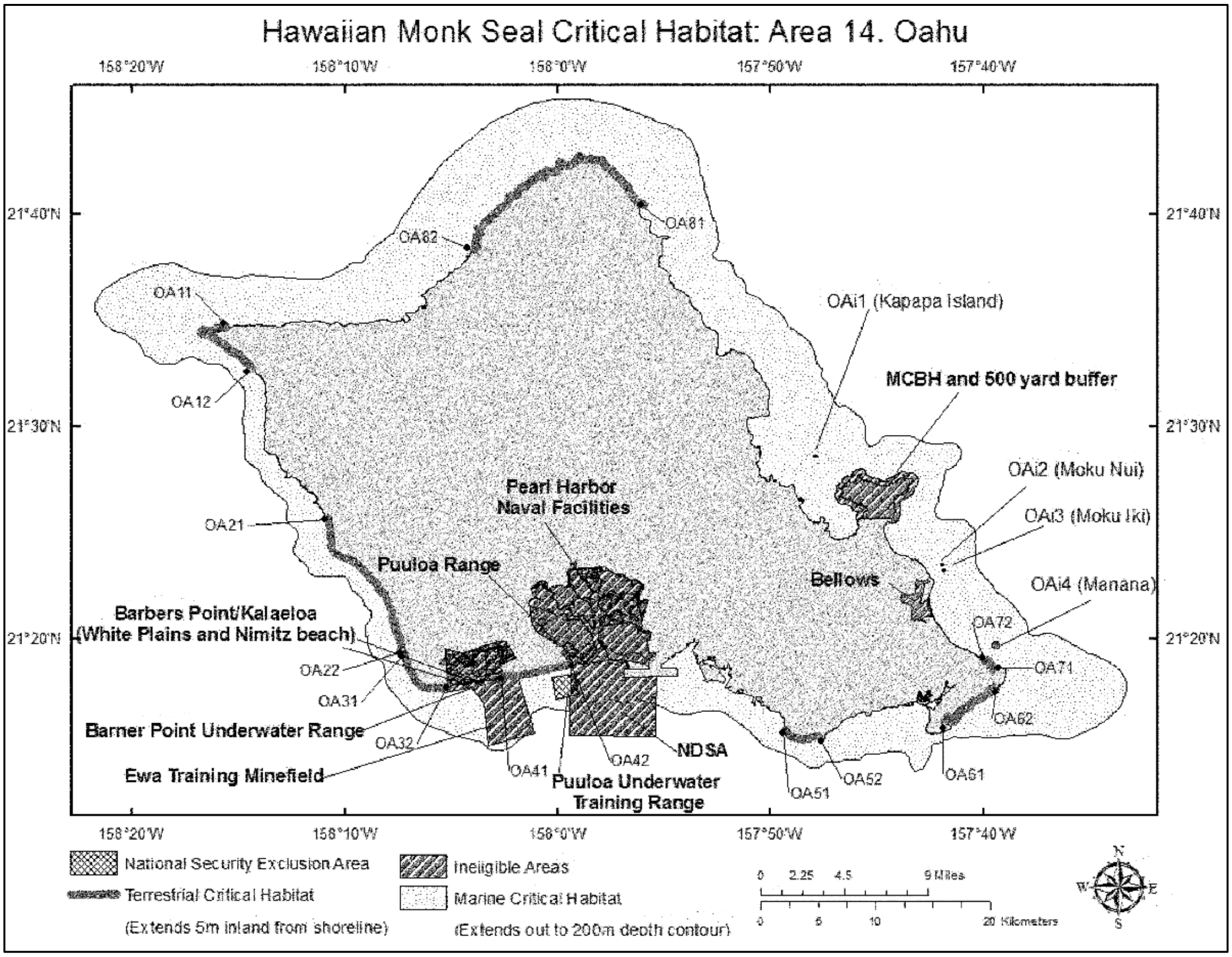

Figure 5. Designated Hawaiian monk seal critical habitat around Oʻahu (NOAA, 2015).

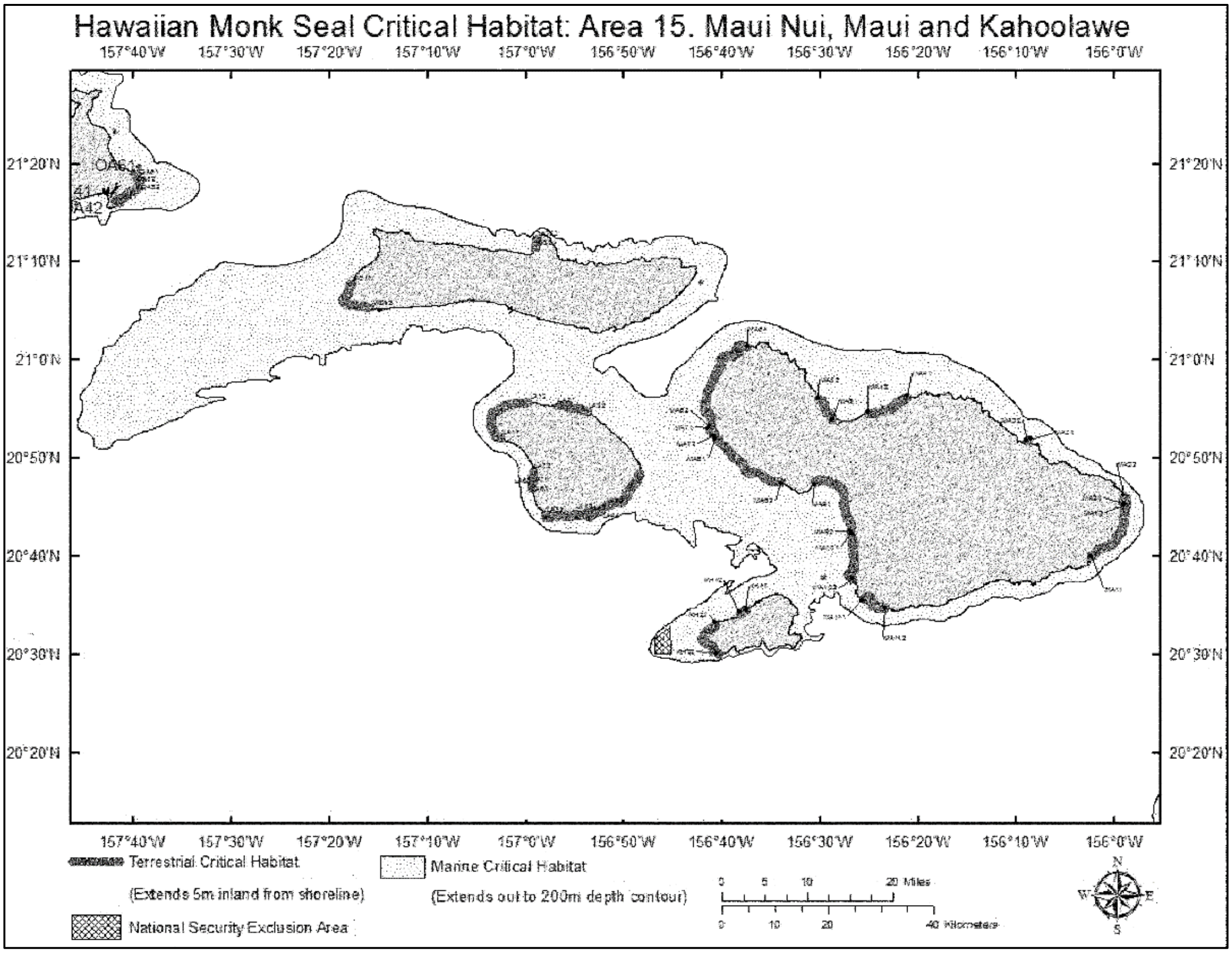

Figure 6. Designated Hawaiian monk seal critical habitat around Molokaʻi, Lānaʻi, and Maui (NOAA, 2015).

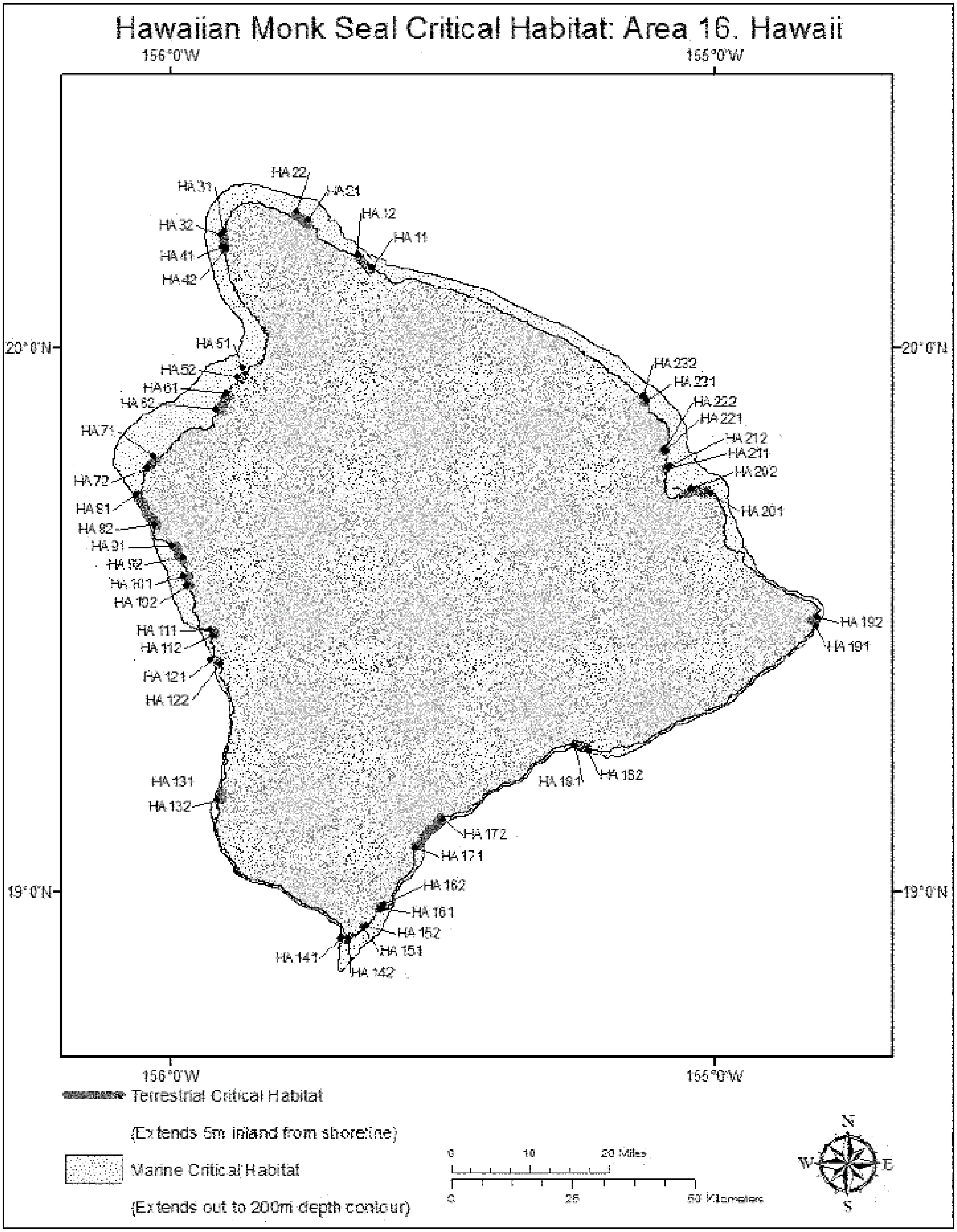

Figure 7. Designated Hawaiian monk seal critical habitat around Hawaiʻi (NOAA, 2015).

3.2.1.2.2 Insular False Killer Whale

There are three populations (or stocks) of false killer whales in Hawaiian waters: an offshore (pelagic) population, a Northwestern Hawaiian Islands population, and a small population associated with the Main Hawaiian Islands, also referred to as the Main Hawaiian Islands insular false killer whales (IFKWs). The Main Hawaiian Islands IFKWs (*Pseudorca crassidens*) were listed as an endangered DPS under the ESA on November 28, 2012 (77 FR 70915). On November 3, 2017, NMFS proposed a rule (82 FR 51186) to designate critical habitat for Main Hawaiian Islands IFKWs in waters from 45 m (150 ft) to 3200 m (10,500 ft) in depth surrounding the Main Hawaiian Islands (from Niʻihau to Hawaiʻi Island). This would not include most bays, harbors, or coastal in-water structures. Also proposed to be excluded are nine areas based on the potential economic and national security impacts and two areas that are managed under the Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan (INRMP) (these areas are detailed in the proposed rule 82 FR 51186). The Main Hawaiian Islands IKFWs are also protected under the MMPA.

False killer whales are aptly named based on their conical teeth that resemble a killer whale. They are mostly black with a gray patch on their ventral side and a conical head. Adults can grow up to 5-6 m (16-20 ft) in length and weigh up to 454-1361 kg (1,000-3,000 lbs) and their diet consists mainly of fish and squid (NMFS, 2017g). As marine mammals, they are highly social and form pods of 10-40 individuals in Hawaiʻi and up to 100 in other locations. The most recent stock assessment estimates the Main Hawaiian Islands IFKW population at 151 individuals and suggests that the stock may have declined over the past two decades between 1989 and 2007 (NMFS, 2016).

The Main Hawaiian Islands IFKWs population consists of long-term residents. Their range is described as nearshore to 51-115 km (32-71 mi) offshore (depending on if they are on the windward or leeward side of the archipelago) and is more specifically defined by the depth contours around the Hawaiian Islands (Figure 8). This area ranges from the 45 m (150 ft) to the 3200 m (10,499 ft) isobaths around the Islands, which are also the boundaries described in the proposed critical habitat designation. Satellite tagging data collected and analyzed by Baird et al. (2010 and 2012) and Cascadia Research Collective (2017) were used in the determination of the species range around the Main Hawaiian Islands. This data also revealed that Main Hawaiian Islands IFKWs restrict their movements and foraging to waters surrounding the Main Hawaiian Islands and are found in deeper areas just offshore, rather than the shallow nearshore habitats (Baird et al., 2012).

Potential threats to the Main Hawaiian Islands IFKW population include interactions with fisheries, marine debris entanglement, anthropogenic noise, and marine pollutants. Anthropogenic noise is considered a threat due to the highly complex acoustic sensory system this species possesses, similar to other toothed whales. Chronic anthropogenic noise may affect their ability to detect or interpret important acoustic cues that are vital to their ability to forage, reproduce, socialize, travel, and avoid predators (NMFS, 2017g).

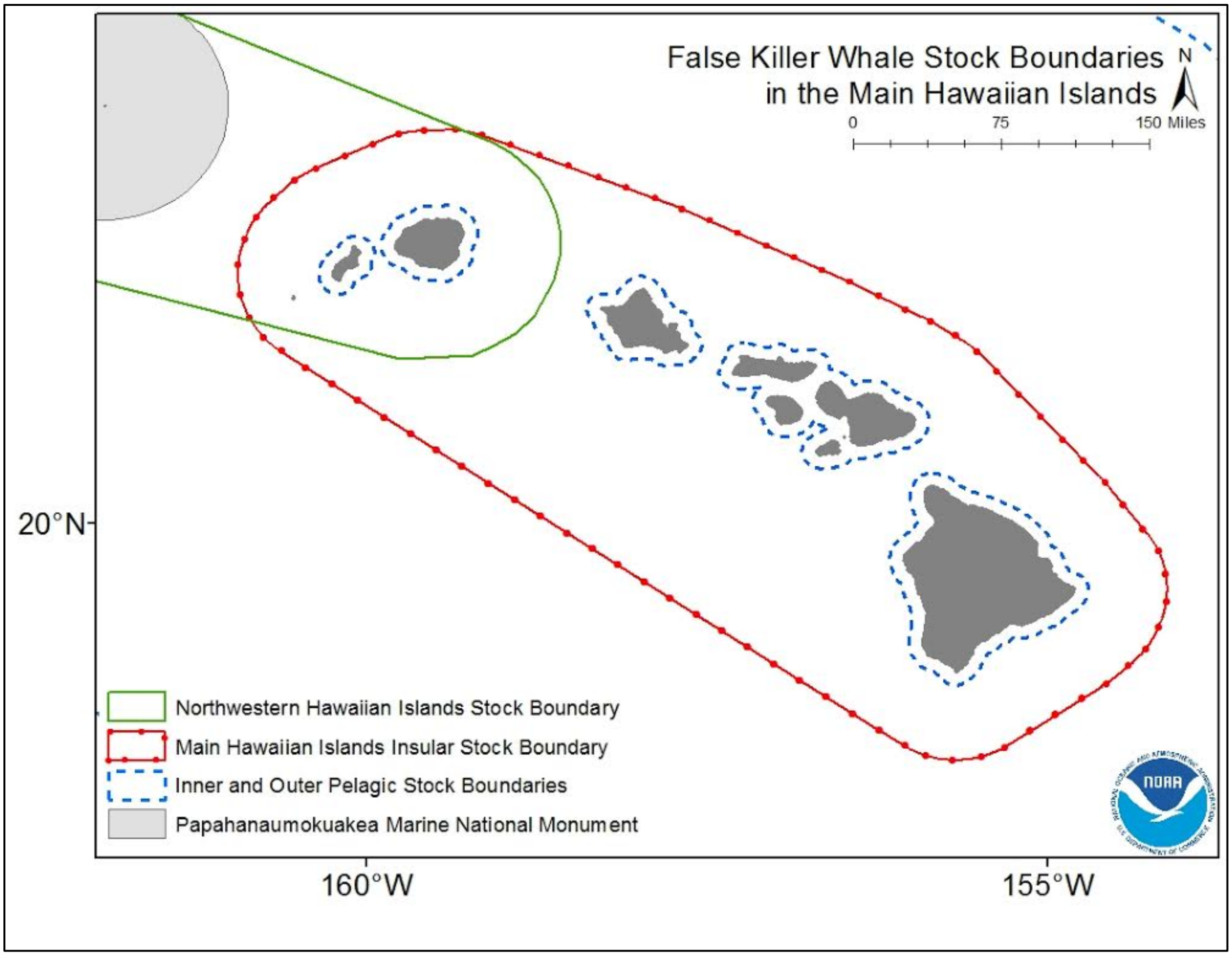

Figure 8. False killer whale stock boundaries in the Main Hawaiian Islands (NMFS, 2017h, modified from Bradford et al., 2015).

3.2.1.3 Fish

3.2.1.3.1 Giant Manta Ray

The giant manta ray (*Manta birostris*) is currently proposed as threatened under the ESA (82 FR 3694). This proposed rule was initiated by a November 10, 2015 petition from Defenders of Wildlife which also included the request to designate critical habitat alongside the final listing. As part of this process, a detailed status review of the species was conducted and published in 2016 (Miller and Klimovich, 2016). This review contains extensive species information such as life history and ecology, abundance trends, analysis of the ESA Section 4(A)(1) factors and extinction risk analysis.

The IUCN lists both species within the *Manta* genus as vulnerable, which indicates that the species is facing a high risk of extinction in the wild. The genus is also listed on Appendix II of CITES, which provides protections regarding international trade of the animals and requires very closely restricted and controlled regulations to avoid over utilization. In addition, *M. birostris* is listed on both Appendix I and II of the Convention of Migratory Species (CMS). This listing aims to conserve migratory species throughout their range, including their habitats and migratory routes. Manta rays are also protected under Hawai‘i state law (Manta Trust, 2017).

The giant manta ray can weigh up to 2,400 kg (5,300 lbs) and extend up to 8 m (25 ft) in length. It is characterized by a diamond-shaped body that is black on the dorsal side and white on the ventral side. The giant manta ray has paired cephalic lobes and a wide terminal mouth which they use to feed on plankton. As pelagic planktivores, the giant manta ray seasonally inhabits coastlines with regular upwelling, oceanic island groups, and offshore pinnacles and seamounts (NMFS, 2017f). They also have been observed utilizing inshore areas such as shallow reefs (less than 10 m or 32 ft in water depth), sandy bottom areas, and seagrass beds (O'Shea et al., 2010; Marshall et al., 2011; Rohner et al., 2013). Overall, the species has a global distribution and is considered migratory; however, studies also suggest that this species may have a higher degree of site fidelity than previously thought (Stewart et al., 2016).

In Hawai‘i, giant manta rays are known to congregate near Kona, which has been correlated to the high zooplankton abundance in this area (Clark, 2010 and Osada, 2010). The total estimated number of individuals observed at Kona was 29, which is the lowest count of individuals out of the 12 identified locations adapted from CITES (2013). The highest number of individuals (approximately 650) was reported at Isla de la Plata, Ecuador with a subpopulation estimate of 1,500 individuals (CITES, 2013; Sanchez, 2016).

The overall low population numbers of giant manta rays are in part due to the threats that these animals face, namely targeted fisheries and bycatch. Manta rays are primarily sought after for their gill plates, which are used in traditional medicine. In addition, the cartilage and skins are also valued in the international trade market (NMFS, 2017f). To a lesser extent, tourism may also negatively impact manta rays by potentially altering their behavior and by divers inadvertently damaging their habitat and/or inappropriately interacting (i.e. touching) the animals. Lower biodiversity and prey availability at overexploited dive sites has also been observed (Miller and Klimovich, 2016).

3.2.1.4 Birds

3.2.1.4.1 Band-Rumped Storm Petrel

The band-rumped storm-petrel (Oceanodroma castro) is a highly pelagic seabird that occurs in both the Atlantic and Pacific Ocean regions. Further research is needed for this species; however, it has been observed nesting in crevices or holes in cliff faces and remote lava flows on Kaua‘i, Lehua, and Hawai‘i (KESRP, 2018b; 81 FR 67786). After fledging (when young birds leave the nest), there have been sitings of this species along the coasts of Kaua‘i and calling activity may suggest that breeding occurs on Kaua‘i, Lāna‘i, Maui, and Hawai‘i. Breeding season occurs March 1 to December 15 and fledging occurs September 15 to December 15. This species feeds only at sea and their diet consists of small fish, squid, and crustaceans.

The band-rumped storm-petrel was listed as endangered under the ESA on September 30, 2016 (81 FR 67786). During the listing process the USFWS determined that the Hawaiian population of this species was a distinct population segment based on the breeding and foraging range. Therefore, it is the Hawaiʻi DPS of the band-rumped storm-petrel that is listed as endangered. This species is also protected under the Migratory Bird Treaty Act (MBTA) and evaluated as least concern under the IUCN.

3.2.1.4.2 Newell's Shearwater

The Newell's shearwater (*Puffinus auricularis newelli*) is a pelagic seabird that spends the majority of its time at sea and only comes to shore during the breeding season. This species is endemic to Hawaiʻi and has experienced drastic population declines in the past three decades. Approximately 90% of the population is known to nest on Kauaʻi in high altitude locations (160-1,200 m or 525-3,937 ft). The Newell's shearwater nests in burrows associated with various types of vegetation, such as ferns, mesic forests on steep slopes, tussock-grass, and within tree root structures. Small breeding colonies have also been observed on Hawaiʻi and Maui and possibly on Molokaʻi, Lānaʻi, and Lehua. During the breeding season (March 1 to December 15) this species transits between the sea and the nesting grounds to feed and the young birds head towards the sea from September 15 to December 15. Like other seabirds, their diet consists of fish and squid (BirdlLife International, 2017; KESRP, 2018c).

The Newell's shearwater was listed as threatened under the ESA on October 28, 1975 (40 FR 44149) and is listed as endangered under the IUCN due to the large population declines. It is also protected under the MBTA. Currently this species is considered a subspecies of the Townsend's shearwater (*Puffinus auricularis*); however, ongoing research may change the taxonomic structure of this species in the future (81 FR 8004; 81 FR 29165).

3.2.1.5 Insects

3.2.1.5.1 Yellow-Faced Bee

In Hawaiʻi, there are approximately 60 native species of yellow-faced bee that are classified under the *Hylaeus* genus. Of these species, seven were petitioned by the Xerces Society in 2015 to be listed as endangered under the ESA and the final rule listing all seven species was published by USFWS on September 30, 2016 (81 FR 67786). Under the guidance of the USFWS (2017), five of the listed species are assessed in this PEA as listed in Table 16: *H. anthracinus*, *H. assimulans*, *H. facilis*, *H. hilaris*, and *H. longiceps*.

Yellow-faced bees depend on a variety of habitats, including coastal strand, dry forest and shrublands, mesic and wet forests, and subalpine shrublands (Xerces Society, 2018). Within these habitats, the majority of species nest in the ground while others nest in the hollow stems of plants. Yellow-faced bees are important pollinators to the native plants and trees of Hawaiʻi and both the native vegetation and bees depend on each other for survival. Population numbers have greatly declined for each of these yellow-faced bee species. Although they have historically been observed in the habitats listed in Table 16, in many cases the species are restricted to small patches of habitat and observations are rare.

Table 16. Summary of the distribution and habitat preferences of the yellow faced bees native to Hawaiʻi (Xerces Society, 2018; 81 FR 67786)

Species	Distribution	Habitat
H. anthracinus	Oʻahu, Molokaʻi, Kahoʻolawe, Maui, Hawaiʻi, and formerly Lānaʻi	Coastal strand
H. assimulans	Maui, Kahoʻolawe, and formerly Oʻahu	Coastal strand and dry forest
H. facilis	Oʻahu, Molokaʻi, and formerly Lānaʻi, and Maui	Dry to mesic forest and shrubland
H. hilaris	Molokaʻi and formerly Maui and Lānaʻi	Coastal strand (obligate cleptoparasite to *H. anthracinus¸ H. assimulans, and H. longiceps*)
H. longiceps	Maui, Lānaʻi, Molokaʻi, and Oʻahu	Coastal strand

3.2.1.6 Plants

The Hawaiian Islands host a diverse and extensive number of plant species that likely arrived on the islands by wind, currents, or by the assistance of animals (as passengers or within the organism). A majority of these native Hawaiian plant species are also endemic (i.e. found only in the archipelago), which increases the need for conservation and protection. The USFWS currently lists 424 endangered or threatened plant species under the ESA that are believed or known to occur in Hawaiʻi (USFWS, 2015). In coordination with USFWS, this list was refined to incorporate only those species that may potentially be affected by the proposed project (Table 17).

Table 17. Summary of listed plant species that may be affected by the proposed project. Critical habitat units are only provided for areas that are within the scope of the PEA.

Common Names	Scientific Name	Distribution	Habitat	Critical Habitat
ʻEwa hinahina Round chaff flower Round-leaf chaff flower	*Achyranthes splendens* var. *rotundata*	Endemic small shrub Height = 0.6-1.8 m (2-6 ft)	Found in low elevations in open, dry forest remnants and open thickets, on talus or rocky slopes, and on coralline plains (Wagner et al., 1999); emerged coral reef with calcareous substrates in Oʻahu (Bruegmann & Caraway, 2003a).	**77 FR 57648** 09/18/2012 Oʻahu Coastal Unit 1 Oʻahu Coastal Unit 15
ʻAkoko	*Chamaesyce skottsbergii* var. *skottsbergii*	Endemic small shrub Height = 0.2-2.0 m (0.5-6 ft)	Associated with mesquite *(Prosopis)* forests on bare, corraline soils on Oʻahu and on lithified dunes or raised reef on Molokaʻi (NatureServe, 2017; USFWS, 1993). Found among coastal vegetation and dry shrubland, apparently restricted to calcareous substrates (NPH, 2009).	**77 FR 57648** 09/18/2012 (Not in project areas – Oʻahu: Lowland Dry Units 8, 9, 10, 11)
ʻAkoko	*Euphorbia* (*Chamaesyce) celastroides* var. *kaenana*	Endemic small shrub Height = 0.6-2.0 m (2-6 ft	Found in coastal dry shrubland, windward talus slopes and vegetated cliff faces (68 FR 35950).	**68 FR 35950** 6/17/2003 Units Oʻahu 1, 3, 4, 5, 35 **77 FR 57648** 09/18/2012 Oʻahu–Coastal-Unit 1 Oʻahu–Coastal-Unit 15

Maʻo hau hele	*Hibiscus brackenridgei* *(includes H. brackenridgei subsp. brackenridgei)*	Endemic small to tall shrub/tree Height = 1-10 m (3.3-33 ft)	Associated with dry forests and shrublands, ridges and gulches, and old lava flows (NatureServe, 2017). Native to dry forests and shrub lands at elevations from 400 to 2,600 feet (NTBG, 2017).	**81 FR 17790** 3/30/16 Molokaʻi-Coastal-Unit 1 Molokaʻi-Coastal-Unit 2 Molokaʻi-Coastal-Unit 3 Molokaʻi-Coastal-Unit 6
Hilo ischaemum	*Ischaemum byrone*	Endemic grass with erect stems Height = 40-80 cm (1-2.5 ft)	Prefers coastal dry shrubland and occurs near the ocean, among rocks and cliffs at elevations ranging from 0-75 m (0-250 ft) (USFWS, 1996).	**68 FR 9116** 2/27/2003 **68 FR 39624** 7/2/2003 **81 FR 17790** 3/30/16 Kauaʻi-1-Ischaemum byrone-a Ischaemum Kauaʻi-2-Ischaemum byrone-b Kauaʻi-3-Ischaemum byrone-c Kauaʻi-11-Ischaemum byrone-d Hawaiʻi-21-Ischaemum byrone-a Hawaiʻi-22-Ischaemum byrone-b Molokaʻi-Coastal-Unit 1 Molokaʻi-Coastal-Unit 2 Molokaʻi-Coastal-Unit 3 Molokaʻi-Coastal-Unit 6 Maui-Coastal-Unit 2 Maui-Coastal-Unit 3 Maui-Coastal-Unit 4 Maui-Coastal-

				Unit 5 Maui-Coastal-Unit 6 Maui-Coastal-Unit 7 Maui-Coastal-Unit 8
Carter's Panicgrass	*Panicum fauriei* var. *carteri*	Endemic annual tufted grass Height = 2-30 cm (0.8-11.8 in)	Occurs on basalt substrate of windward coastal cliffs within the salt spray zone; associated with windswept herb and low shrub coastal communities (USFWS, 1994; 2011).	**48 FR 46328** 10/12/1983 (Not in project areas - entire island of Mokoliʻi, Oʻahu)
ʻIhi	*Portulaca villosa*	Endemic succulent herb; prostrate stems Length = 30-80 cm (1-2.5 ft)	Occurs on dry, rocky, clay, lava, or coralline reef sites, from sea level to 490 m (1,600 ft), in the coastal (Lehua, Kaʻula, Oʻahu, Kahoʻolawe, Maui, and Hawaiʻi Island) and lowland dry (Oʻahu, Molokaʻi, Lānaʻi, Kahoʻolawe, Maui, and Hawaiʻi Island) ecosystems, and one reported occurrence in the montane dry (Hawaiʻi Island) ecosystem (81 FR 67786; CTAHR, 2000; NPH, 2009).	None Designated
ʻEnaʻena	*Psuedognaphalium sandwicensium* var*. Molokaiense*	Endemic herb; prostrate stems Length = 10-31 cm (4-12 in)	Found in dry habitats, usually coastal. Occurs on calcareous	None Designated

			sand dunes (either unconsolidated or lithified), or basaltic substrates such as sea cliffs, steep rocky slopes, eroded ridges, and outcrops (NatureServe, 2017; 80 FR 58820; 81 FR 67786).	
Dwarf naupaka	*Scaevola coriacea*	Endemic prostrate succulent shrub Height = 0.6 m or less (2 ft or less)	Occurs in dry coastal areas on consolidated sand dunes and thin basaltic soils (NatureServe, 2017; NPH, 2009; USFWS, 2014; 51 FR 17917).	None Designated
Awiwi	*Schenkia* (*Centaurium*) *sebaeoides*	Endemic annual herb Height = 6-20 cm (2-8 in)	Primarily at coastal sites with coralline or basaltic substrates and also utilizes dry shrublands. (Bruegmann & Caraway, 2003b; NatureServe, 2017).	**68 FR 9116** 2/27/2003 **68 FR 39624** 7/2/2003 **77 FR 57648** 09/18/2012 **81 FR 17790** 3/30/2016 Kauaʻi-11-Centaurium sebaeoides-a Oʻahu-Coastal-Unit I Oʻahu-Coastal-Unit 15 Molokaʻi-Coastal-Unit I Molokaʻi-Coastal-Unit 2 Molokaʻi-Coastal-Unit 3 Molokaʻi-Coastal-Unit 6 Maui-Coastal-Unit 9 Maui-Coastal-Unit 10

ʻŌhai	*Sesbania tomentosa*	Endemic erect to prostrate shrub/tree Length = up to 14 m (46 ft) Height = 2.5-6 m (8-20 ft)	Occurs on calcareous beaches and sand dunes, rocky ridges and slopes, deep red soil, and on soil pockets on lava. Often found on coastal and dry shrublands rather than dry forests or inland (DLNR DOFAW, 2018).	**68 FR 9116** 2/27/2003 **68 FR 39624** 7/2/2003 **77 FR 57648** 09/18/2012 **81 FR 17790** 3/30/2016 Kauaʻi–8–Sesbania tomentosa-a Hawaiʻi–20–Sesbania tomentosa-a Oʻahu–Coastal–Unit I Oʻahu–Coastal–Unit 15 Molokaʻi–Coastal–Unit 1 Molokaʻi–Coastal–Unit 2 Molokaʻi–Coastal–Unit 3 Molokaʻi–Coastal–Unit 6 Maui–Coastal–Unit 9 Maui–Coastal–Unit 10
Popolo	*Solanum nelsonii*	Endemic shrub Height = 0.6-1.8 m (2-6 ft)	Found in coastal dry shrublands and grasslands on unconsolidated coral sand dunes, lithified dunes, or in coral rubble (NatureServe, 2017, NHP, 2009).	None Designated

3.2.2 Essential Fish Habitat

The Magnuson Fishery Conservation and Management Act of 1976, amended Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act, MSFCMA) by the Sustainable Fisheries Act of 1996, set forth a mandate to identify and protect important marine and estuarine fish and their habitat. The U.S. Congress enacted the Magnuson-Stevens Act to support the government's goal of sustainable fisheries. Crucial to achieving this goal is the maintenance of suitable marine fishery habitat quality and quantity. This goal is achieved through identifying and describing Essential Fish Habitat (EFH), describing non-fishing and fishing threats, and suggesting measures to conserve and enhance EFH. The Magnuson-Stevens Act defines EFH as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16. U.S.C. 1802 (10))."

The Western Pacific Regional Fishery Management Council has managed fisheries throughout the Western Pacific Region since the 1980s through separate species-based Fishery Management Plans (FMPs) – the Bottomfish and Seamount Groundfish FMP (WPRFMC, 1986a), the Crustaceans FMP (WPRFMC, 1981), the Precious Corals FMP (WPRFMC, 1979), the Coral Reef Ecosystems FMP (WPRFMC, 2001), and the Pelagic FMP (WPRFMC, 1986b). However, the Council has since switched their focus from a species-based approach to an ecosystem-based approach and in 2010 five new Fishery Ecosystem Plans (FEPs) were approved, which are consistent with the MSFCMA and the national standards for fishery conservation and management (75 FR 2198). The five FEPs are as follows: American Samoa FEP, Hawaiian Archipelago FEP, Marianas FEP, Pacific Remote Islands Area FEP, and the Pelagic FEP. The Hawaiian Archipelago FEP incorporates all of the management regulations of the FMPs listed above that are applicable to the waters around the Hawaiian Islands except for the Pelagic FMP which has its own FEP. The management area of the Pelagic FEP is the United States Exclusive Economic Zone (EEZ) of the archipelago.

The Hawaiian Archipelago FEP is the framework under which the Council will manage place-based fishery ecosystem resources, including the integration of important ecosystem elements important to decision-making. These elements include social, cultural, and economic dimensions, protected species, habitat considerations, climate change effects, and the implications to fisheries from various spatial uses of the marine environment. Successful ecosystem-based fisheries management requires an increased understanding of a range of social and scientific issues, including the societal goals, appropriate management objectives, biological and trophic relationships, ecosystem indicators and models, and the ecological effects of non-fishing activities on the marine environment (WPRFMC, 2016a).

3.2.2.1 Designated Essential Fish Habitats

The Hawaiian Archipelago FEP provides information for both the Main Hawaiian Islands and Northwestern Hawaiian Islands. The following information focuses on the Main Hawaiian Islands and Table 18 provides the EFH designations for each management unit species managed by the WPRFMC.

Table 18. Designated EFH for federally managed species referred to as Management Unit Species (MUS).

Management Unit Species (Groups)	EFH for Eggs and Larvae	EFH for Juveniles and Adults
Bottomfish	Water column down to 400 meters depth from shoreline out to the 200-mile U.S. Exclusive Economic Zone (EEZ) boundary.	Water column and all bottom from shoreline down to 400m depth.
Seamount Groundfish	Water column down to 200 meters depth of all EEZ waters bounded by 29°–35° N and 171° E –179° W.	Water column and bottom from 200 meters to 600 meters depth, bounded by 29°–35° N and 171° E –179° W.
Crustaceans	Lobsters/crab: Water column down to 150 meters depth from shoreline out to EEZ boundary. Deepwater shrimp: The outer reef slopes between 300-700 meters depth.	Lobsters/crab: Bottom from shoreline down to 100 meters depth. Deepwater shrimp: Outer reef slopes between 550-700 meters depth.
Pelagics	Water column down to 200 meters depth from shoreline out to EEZ boundary.	Water column down to 1000 meters depth from shoreline out to EEZ boundary.
Precious Corals	Known precious coral beds in the Hawaiian Islands located at: Keāhole Point, between Miloliʻi and South Point, the ʻAuʻau Channel, Makapuʻu, Kaʻena Point, the southern border of Kauaʻi, Wespac bed, Brooks bank bed, and 180 Fathom Bank.	
Coral Reef Ecosystem	Water column and all bottom down to 100 meters depth from shoreline out to EEZ boundary.	

3.2.2.1.1 Bottomfish Management Unit Species

The bottomfish management unit contains seven deep bottomfish species, seven non-deep species, and three seamount groundfish species (Table 19). This fishery management area is divided into three sub-areas: Main Hawaiian Islands, Northwestern Hawaiian Islands, and Hancock Seamount. Figure 9 depicts the Main Hawaiian Islands management areas.

Table 19. Hawaiian archipelago Bottomfish Management Unit Species (BMUS) (WPRFMC, 2016a).

	Scientific Name	Common Name	Hawaiian Name
Deep-7 BMUS	*Aphareus rutilans*	Silver jaw jobfish	lehi
	Pristipomoides filamentosus	Pink snapper	ʻōpakapaka
	P. seiboldii	Pink snapper	kalekale
	P. zonatus	Snapper	gindai
	Epinephelus quernus	Sea bass	hāpuʻupuʻu
	Etelis carbunculus	Red snapper	ehu
	Etelis coruscans	Longtail snapper	onaga or ʻulaʻula koaʻe
Deep-7 BMUS	*Lutjanus kasmira*	Blue stripe snapper	taʻape
	P. auricilla	Yellowtail snapper	kalekale
	Aprion virescens	Gray jobfish	uku
	Caranx ignobilis	Giant trevally	white papio/ulua au kea
	C. lugubris	Black jack	ulua laʻuli
	Pseudocaranx dentex	Thicklip trevally	pig ulua, butaguchi
	Seriola dumerili	Amberjack	kahala
Seamount Groundfish	*Hyperoglyphe japonica*	Raftfish	N/A
	Beryx splendens	Alfonsin	N/A
	Pseudopentaceros wheeleri	Armorhead	N/A

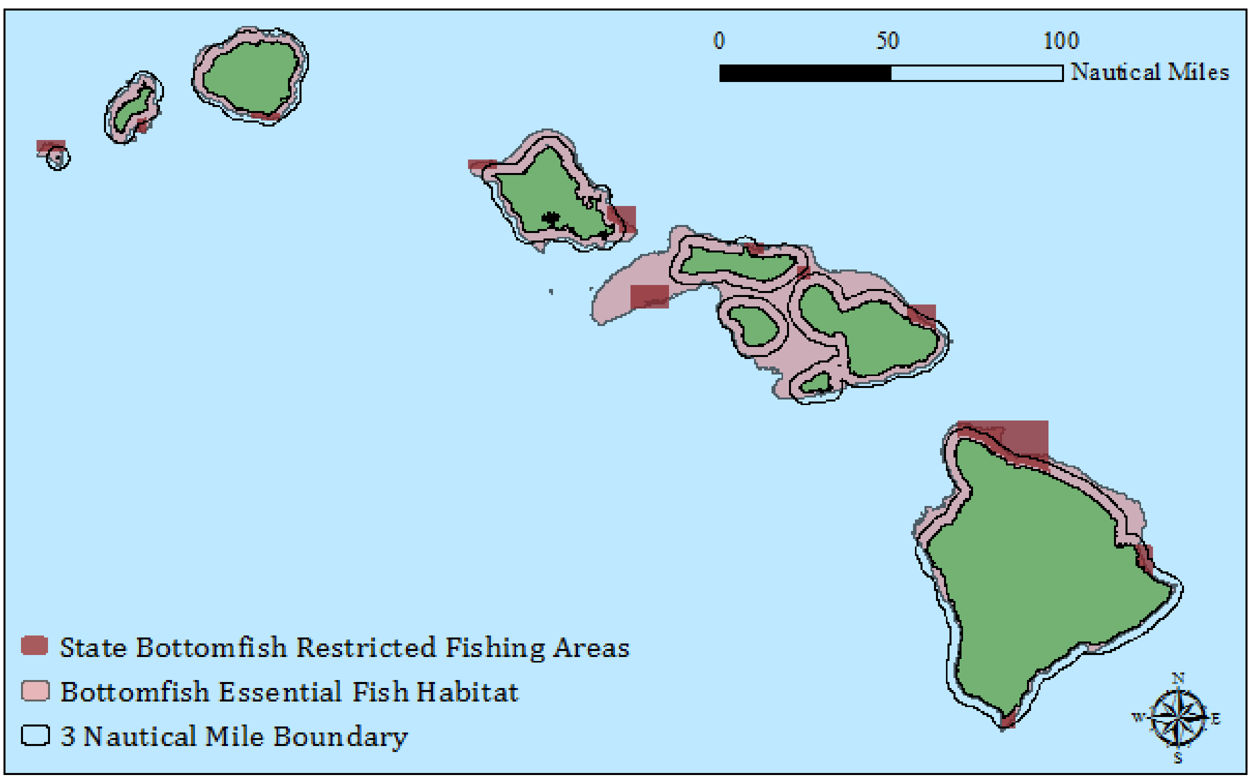

Figure 9. Map of the Main Hawaiian Islands depicting the bottomfish management areas and EFH (WPRFMC, 2016a).

3.2.2.1.2 Precious Corals Management Unit Species

The precious coral fishery management areas include established beds (Makapuʻu and ʻAuʻau Channel Beds), conditional beds (Keāhole Point, Hawaiʻi and Kaʻena Point, Oʻahu), and an exploratory area. Table 20 lists the precious coral species managed under the Hawaiian Archipelago FEP.

Table 20. Hawaiian archipelago Precious Corals Management Unit Species (WPRFMCV, 2016a).

Scientific Name	English Common Name	Hawaiian Name
Corallium secundum	Pink coral (also called red coral)	N/A
Corallium regale	Pink coral (also called red coral)	N/A
Corallium laauense	Pink coral (also called red coral)	N/A
Gerardia spp.	Gold coral	N/A
Narella spp.	Gold coral	N/A
Lepidisis olapa	Bamboo coral	N/A
Antipathes dichotoma	Black coral	N/A
Antipathes grandis	Black coral	N/A
Antipathes ulex	Black coral	N/A

3.2.2.1.3 Coral Reef Ecosystem Management Unit Species

The EFH description provided in Table 18 for Coral Reef Ecosystem fishery is a broad definition to include the thousands of species of flora and fauna within this fishery. In order to better clarify EFH for this extensive fishery, the Council created a two-tier approach by dividing the species into two categories: Currently Harvested Coral Reef Taxa (CHCRT) and Potentially Harvested Coral Reef Taxa (PHCRT). The CHCRT include species from the following families: Acanthuridae, Balistidae, Carangidae, Carcharhinidae, Holocentridae, Kuhliidae, Kyphosidae, Labridae, Mulllidae, Mugilidae, Muraenidae, Octopodidae, Polynemidae, Priacanthidae, Scaridae, Sphyraenidae, Zanclidae, Chaetodontidae, and Sabellidae. The PHCRT includes 42 families, 3 species, and 17 functional groups (WPRFMC, 2016a). The Hawaiian FEP provides further detailed EFH designations for each species assemblage/complex. Figure 10 through Figure 13 below depict the EHF designated around the Main Hawaiian Islands.

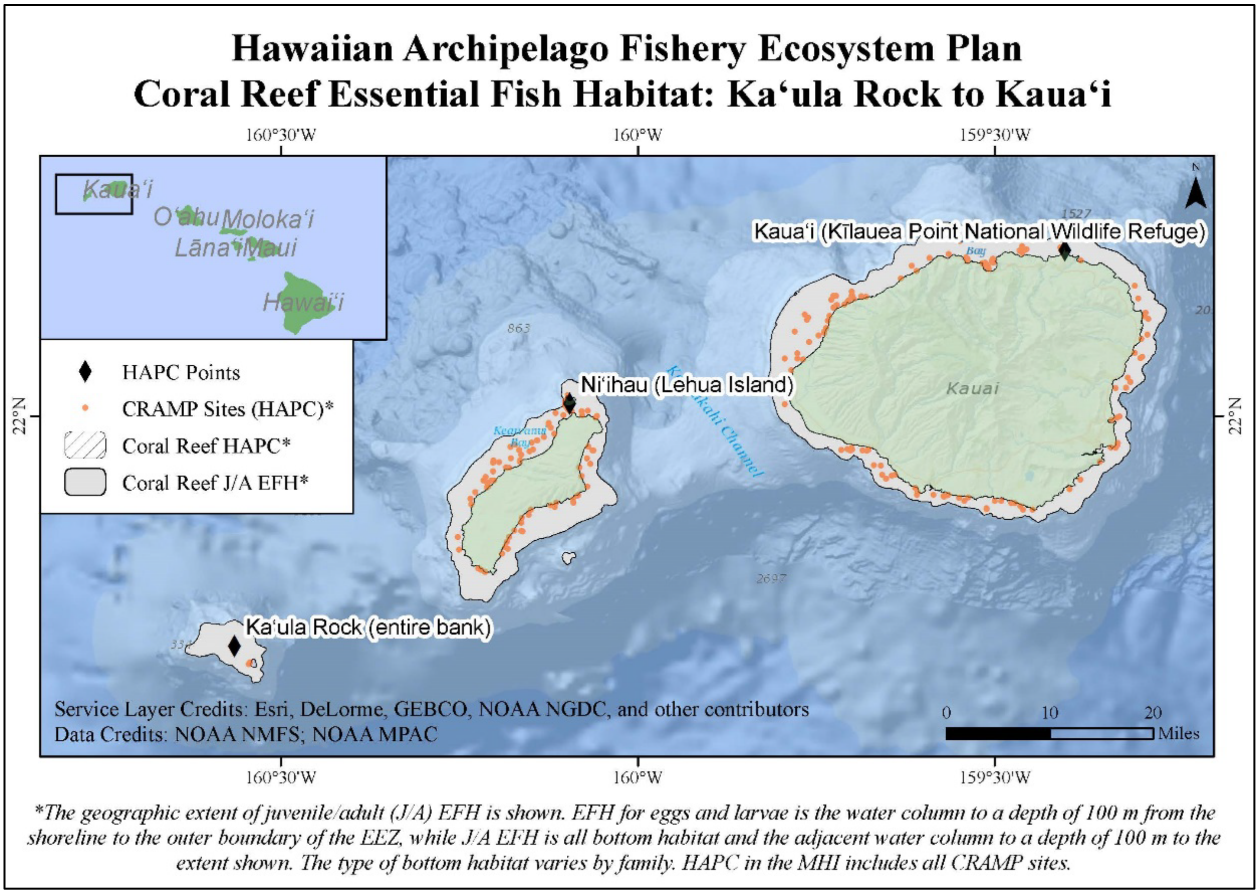

Figure 10. Coral reef ecosystem designated EFH – Kaʻula Rock to Kauaʻi (WPRFMC, 2016a).

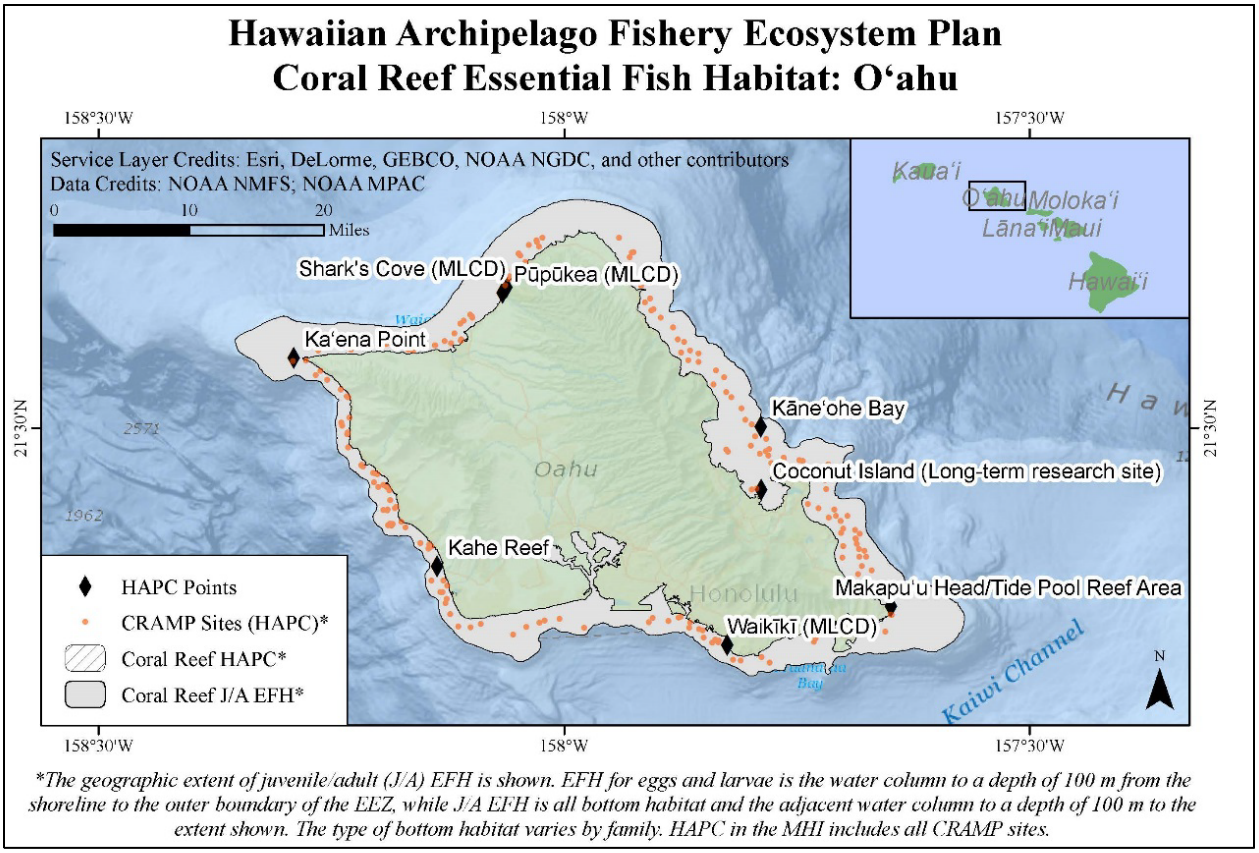

Figure 11. Coral reef ecosystem designated EFH – Oʻahu (WPRFMC, 2016a).

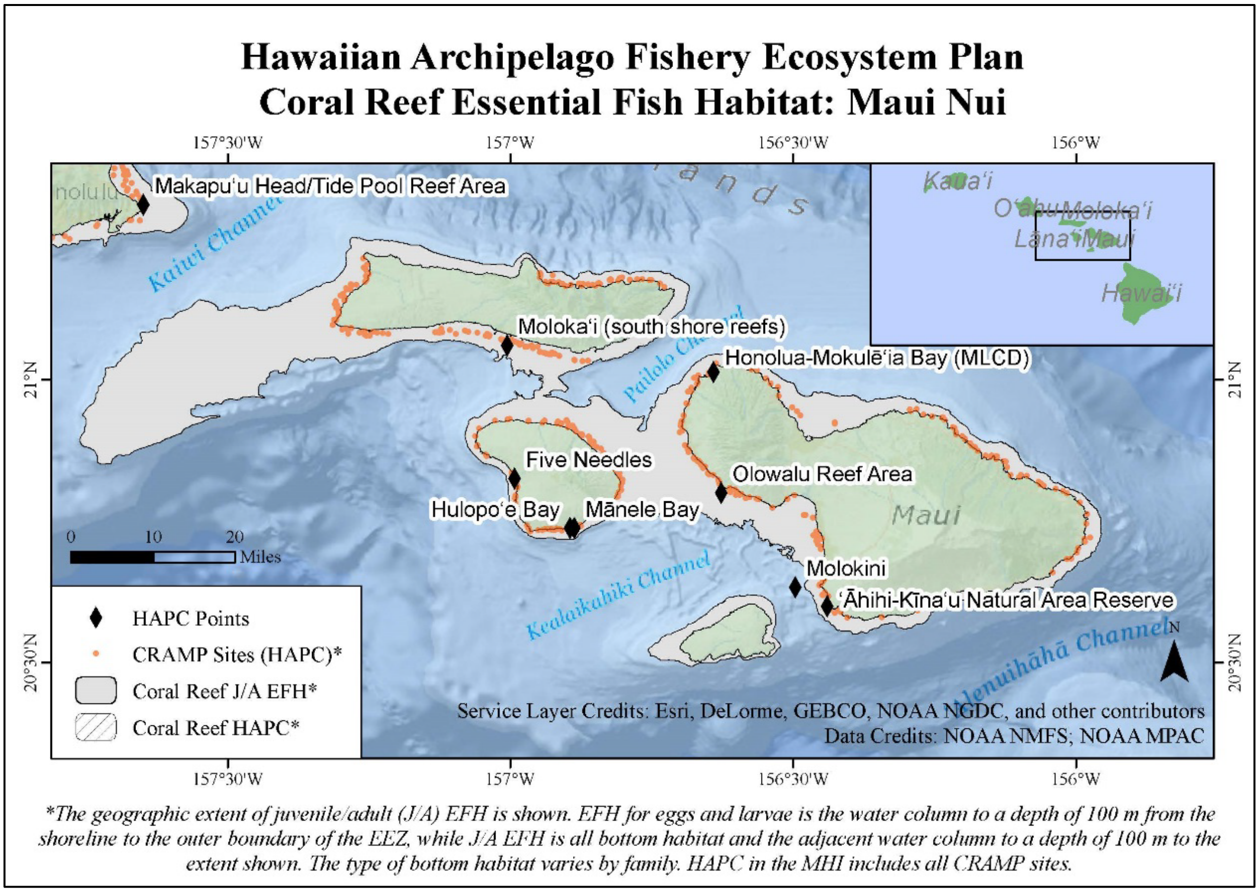

Figure 12. Coral reef ecosystem designated EFH – Maui Nui (WPRFMC, 2016a).

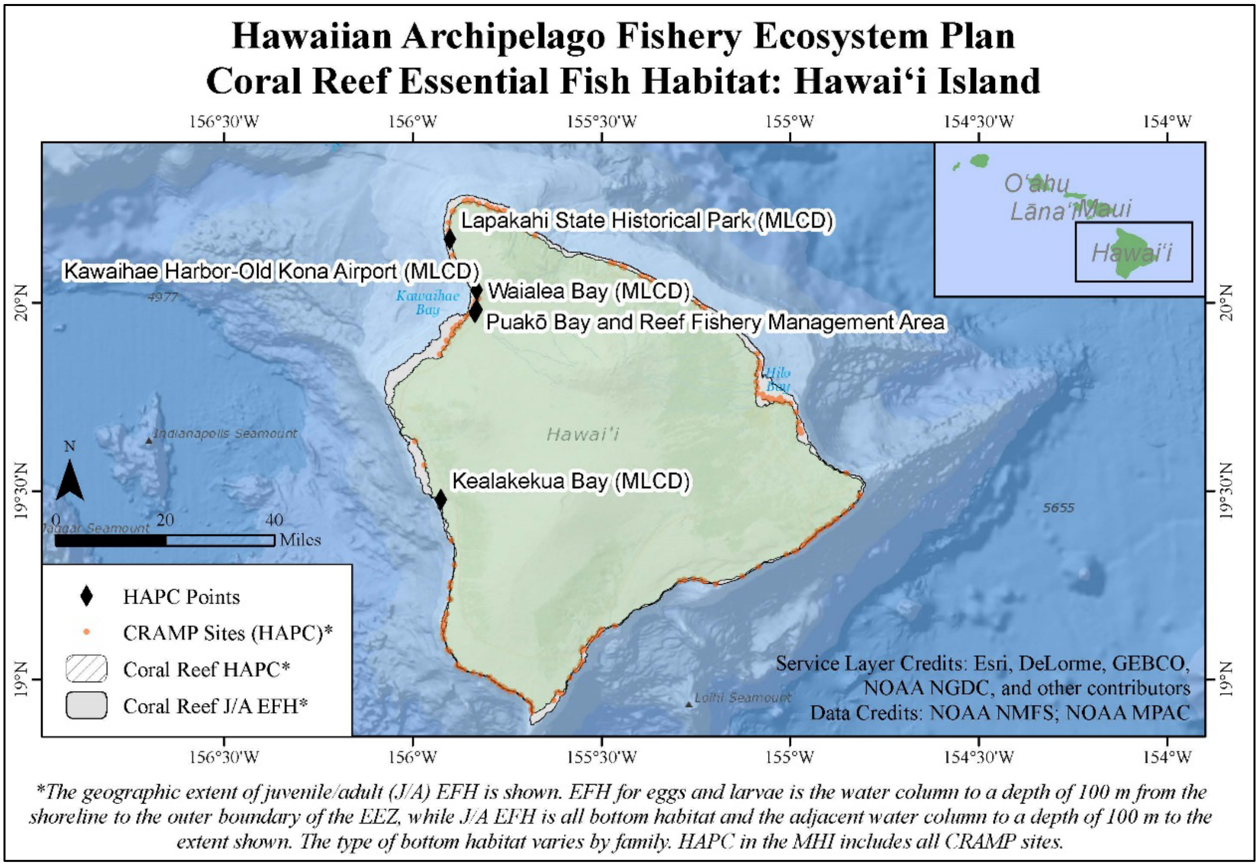

Figure 13. Coral reef ecosystem designated EFH – Hawai‘i Island (WPRFMC, 2016a).

3.2.2.1.4 Crustaceans Management Unit Species

Table 21 lists the managed species within the crustacean fishery. The management area is divided into two permitted areas: the EEZ around the Northwestern Hawaiian Islands and the EEZ around the Main Hawaiian Islands.

Table 21. Hawaiian archipelago Crustaceans Management Unit Species (recreated from WPRFMC, 2016a).

Scientific Name	Common Name	Hawaiian Name
Panulirus marginatus	Spiny lobster	ula
Panulirus penicillatus	Spiny lobster	ula
Family Scyllaridae	Slipper lobster	ula papapa
Ranina ranina	Kona crab	papa‘i kua loa
Heterocarpus spp.	Deepwater shrimp	N/A

3.2.2.1.5 Pelagics Management Unit Species

Table 22 lists the managed species within the pelagic fishery while Figure 14 maps the associated EFH.

Table 22. Pacific Pelagics Management Unit Species (WPRFMC, 2016b).

	Scientific Name	English Common Name	Hawaiian Name
Tunas	*Thunnus alalunga*	Albacore	
	T. obesus	Bigeye tuna	
	T. albacares	Yellowfin tuna	
	T. thynnus	Northern bluefin tuna	
	Katsuwonus pelamis	Skipjack tuna	
	Euthynnus affinis	Kawakawa	
	Auxis spp. *Scomber* spp. *Allothunus* spp.	other tuna relatives	
Billfishes	*Tetrapturus audax*	Striped marlin	
	T. angustirostris	Shortbill spearfish	
	Xiphias gladius	Swordfish	
	Istiophorus platypterus	Sailfish	
	Makaira mazara	Blue marlin	
	M. indica	Black marlin	
Sharks	*Alopias pelagicus*	Pelagic thresher shark	
	A. superciliousus	Bigeye thresher shark	
	A. vulpinus	Common thresher shark	
	Carcharhinus falciformis	Silky shark	
	C. longimanus	Oceanic whitetip shark	
	Prionace glauca	Blue shark	
	Isurus oxyrinchus	Shortfin mako shark	
	I. paucus	Longfin mako shark	
	Lamna ditropis	Salmon shark	
Other Pelagics	*Coryphaena* spp.	Mahimahi (dolphinfish)	Mahi
	Lampris spp.	Moonfish	
	Acanthocybium solandri	Wahoo	Ono
	Gempylidae	Oilfish family	
	Bramidae	Pomfret family	
	Ommastrephes bartamii	Neon flying squid	
	Thysanoteuthis rhombus	Diamondback squid	
	Sthenoteuthis oualaniensis	Purple flying squid	

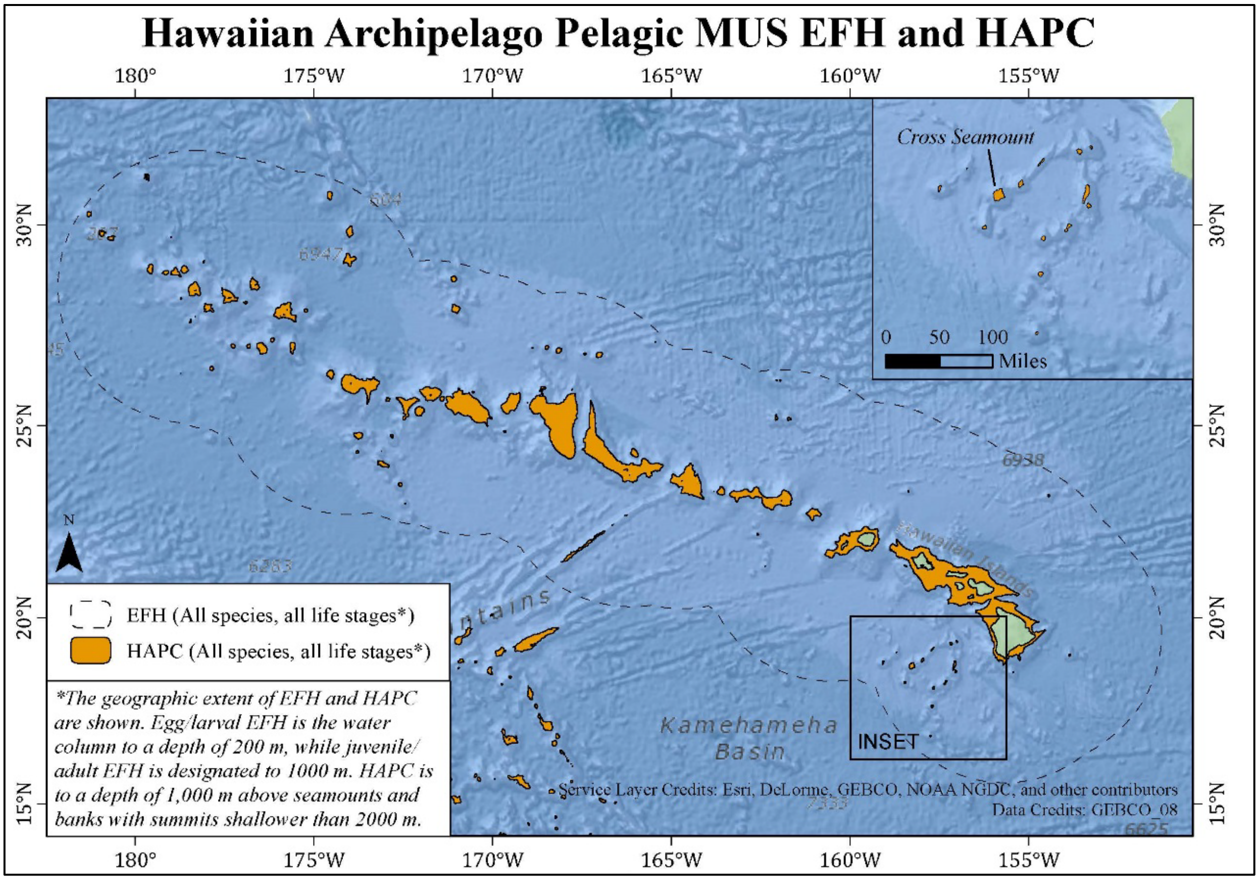

Figure 14. Pelagics designated EFH in the Hawaiian Islands (WPRFMC, 2016b).

3.2.2.2 Designated Habitat Areas of Particular Concern

Habitat Areas of Particular Concern (HAPC) are discreet subsets of EFH and are considered high priority areas for conservation, management, or research because they are rare, sensitive, stressed by development, or important to ecosystem function. These areas provide important ecological functions and/or are particularly vulnerable to degradation. The HAPC designation does not necessarily mean additional protection or restrictions are imposed on an area, but they do help to prioritized and focus conservation efforts. Table 23 presents the HAPCs identified for the management unit species managed by the WPRFMC.

Table 23. Habitat Areas of Particular Concern by Management Unit Species (WPRFMC, 2016a and 2016b).

Management Unit Species (Groups)	Habitat Areas of Particular Concern (HAPC)
Bottomfish	All escarpments/slopes between 40–280 meters throughout the Western Pacific Region, including the Hawaiian Archipelago. In addition, the Council designated the three known areas of juvenile ʻōpakapaka habitat (two off Oʻahu and one off Molokaʻi) as HAPC.
Seamount Groundfish	There is no HAPC for seamount designated within the Hawaiian Archipelago.
Crustaceans	Lobsters/crab: all banks with summits less than 30 meters. Deepwater shrimp: There are no HAPC designated for deepwater shrimp in the Hawaiian Archipelago.
Pelagics	Water column down to 1,000 meters that lie above all seamounts and banks within the EEZ shallower than 2,000 meters.
Precious Corals	Three of the six precious coral beds - Makapuʻu, Wespac and Brooks Bank.
Coral Reef Ecosystem	Main Hawaiian Islands: Kaʻula Rock (entire bank); Niʻihau (Lehua Island); Kauaʻi (Kaliu Point); Oʻahu (Pupkea MLCD, Shark's Cove MLCD, Waikīkī MLCD, Makapuʻu Head/Tide Pool Reef Area, Kāneʻohe Bay, Kaʻena Point, Kahe Reef); Maui (Molokini, Olowalu Reef Area, Honolua-Mokulēʻia Bay MLCD, ʻĀhihi Kīnaʻu Natural Area Reserve, Molokaʻi south reefs); Lānaʻi (Hulopoʼe Bay, Manele Bay, Five Needles); Hawaiʻi (Lapakahi Bay State Park MLCD, Puako Bay and Reef MLCD, Kealakekua, Waialea Bay MLCD, Kawaihae Harbor-Old Kona Airport MLCD); all long-term research sites; and all CRAMP sites.

3.2.3 Scleractinian Corals

Scleractinian is an order of corals often referred to as stony or hard corals. On October 20, 2009, the Center for Biological Diversity petitioned NMFS to list 83 coral species as threatened or endangered under the U.S. Endangered Species Act (ESA). NMFS identified 82 of the corals as candidate species and established a Biological Review Team (BRT) to prepare a Status Review Report to examine those 82 candidate coral species and evaluate extinction risks for each of them. Of those 82 species, NMFS proposed listing for 66 coral species: 59 in the Pacific (7 as endangered, 52 as threatened) and 7 in the Caribbean (5 as endangered, 2 as threatened). On September 10, 2014, NMFS published the final rule (79 FR 53851) to implement the final determination to list 20 coral species as threatened – 15 in the Indo-Pacific and 5 in the Caribbean. Of the 15 Indo-Pacific listed corals, none of them are currently found in the Hawaiian Islands; however, 59 reef-building coral species have been documented in the Main Hawaiian Islands by Maragos et al. (2004).

The Main Hawaiian Islands reefs are dominated by massive, encrusting, and branching corals in the genera *Porites*, *Pocillopora*, *Montipora*, and *Pavona*. These corals primarily make up the 19.9 ± 0.6 % (SE) average coral cover recorded across 1,682 sites in the Main Hawaiian Islands. The percent coral cover has been correlated to the geologic age of the islands, such that the highest cover is found at the youngest islands, which are located at the eastern end of the archipelago. This is in part due to the change in light and temperature conditions as the islands increase in latitude and age. However, wave action, anthropogenic influences, disease, bleaching, climate change, El Niño Southern Oscillation (ENSO) events, and biological competition also factor into the reef assemblages found in the Main Hawaiian Islands (Friedlander et al., 2008).

The Main Hawaiian Islands are volcanic islands that support several different reef types including fringing reefs, barrier reefs, and non-structural reef communities. Fringing reefs border the coast closely and can be around portions of all the Main Hawaiian Islands with the most extensive, developed reefs on Kauaʻi, Oʻahu, Maui, Molokaʻi, and Lānaʻi. There are only two barrier reefs in the archipelago, one is located in Kāneʻohe Bay on Oʻahu and the second is along the north coast of Kauaʻi (Tissot, 2005). Barrier reefs are characterized as growing parallel to the shoreline and being separated from land by a lagoon. The non-structural reef communities do not have the stereotypical structure of a fringing or barrier reef, rather they are less defined patches of shallow benthic coral reef structures growing on the basalt substrate alongside other benthic organisms. Overall, these reef types combine to create approximately 2,536 km^2 (980 square miles) of reef area surrounding the Main Hawaiian Islands, of which 1,656 km^2 (640 square miles) is located within 3 nautical miles of the islands (Cesar et al., 2002). Examples of these reef communities are found along the Kona coast on Hawaiʻi (Cesar et al., 2002 and Gulko et al., 1999). Figure 15 provides a basic overview of where coral and other benthic habitats are located within the Main Hawaiian Islands. The nearshore habitat where potential project-related activities may occur include the non-structural reef communities and the fringing reefs.

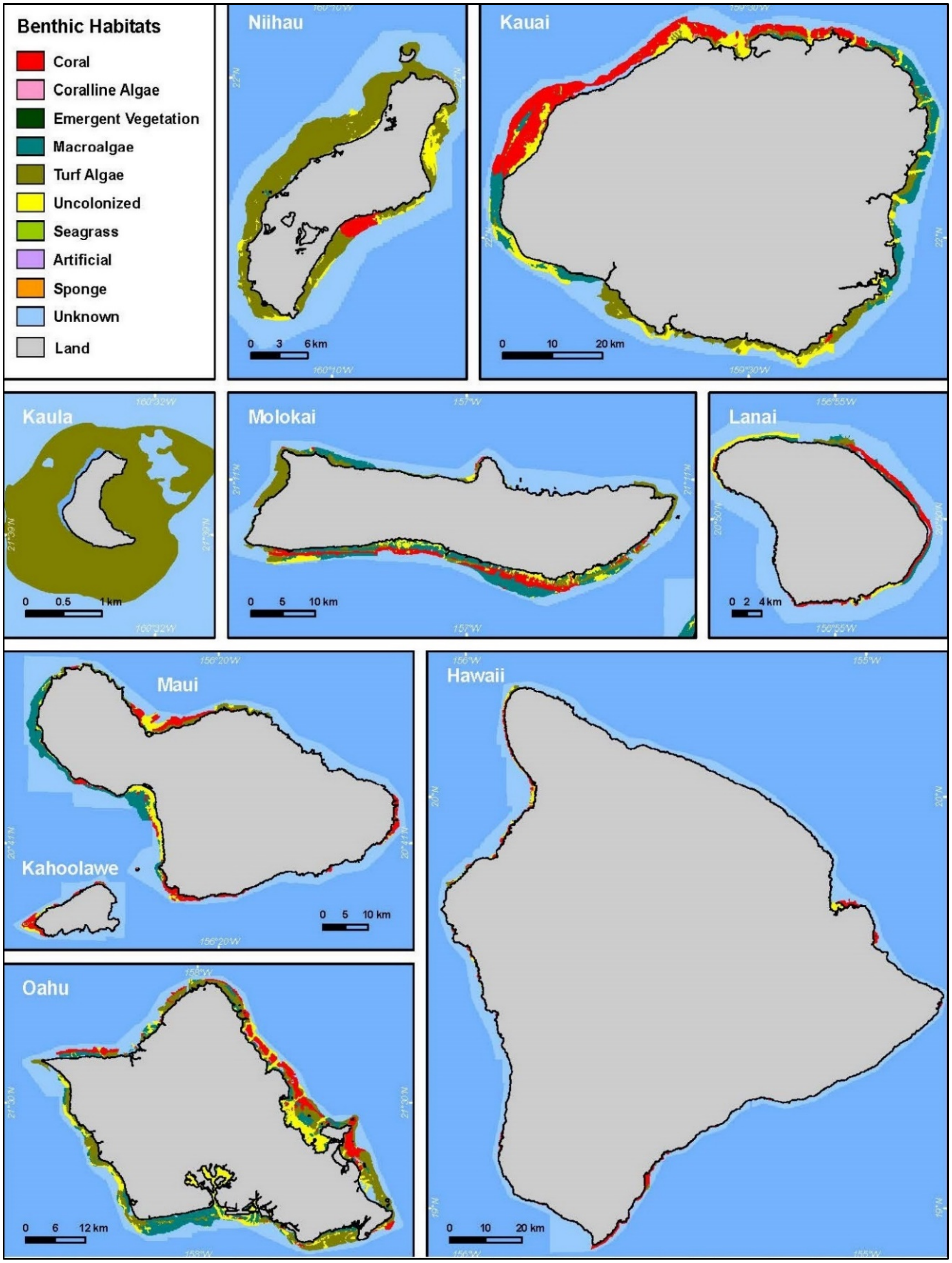

Figure 15. Figure reproduced from Friedlander et al., 2008. "Nearshore benthic habitat maps were developed by CCMA-BB based on visual interpretation of aerial photography and hyperspectral imagery. Map: K.Buja." For more information visit http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html

3.2.4 Benthic Infauna

Portions of the nearshore marine habitat surrounding the Main Hawaiian Islands are composed of unconsolidated softbottom habitat. These unvegetated softbottom intertidal and subtidal areas are important habitats for benthic organisms living on (epibenthos) or within (infauna) the sediment. Shallow subtidal softbottom environments and their constituents may be highly impacted by water turbulence, suspended sediments, and unstable substrate resulting in low species diversity and faunal abundance (Wanless and Maier, 2007; Jordan et al., 2010; Manning et al., 2014). However, this faunal community serves as an important element in the food web, providing food for wading birds, shorebirds, and fish. A study conducted near the Halekulani Channel, O‘ahu characterized the softbottom fauna as being dominated by three main taxa: nematodes (roundworms), oligochaete worms, and copepods (small crustaceans). A study by Fukunaga and Baily-Brock (2008) at Mamala Bay on O‘ahu found that the dominant infaunal organisms include polychaeta, nematoda, crustacea, and oligochaete worms.

3.2.5 Marine Algae

Marine algae are also a major component of the marine ecosystem surrounding the Main Hawaiian Islands. There are an estimated 400 species or more of marine algae found throughout the archipelago (Abbott, 1995). As with other marine functional groups found within the State of Hawai‘i, there is a high rate of endemism within the marine algae taxa. One of these endemic species is the calcareous green alga *Halimeda kanaloana*. This species is particularly interesting due to the large areas it covers within the Main Hawaiian Islands, which are aptly named meadows. These expansive *Halimeda* meadows can cover hundreds of square kilometers of sandy substrate and are found from the intertidal zone down to approximately 100 m (300 ft). The meadows provide several ecological functions such as creating habitat by adding structural complexity, serving as a food source for fish and invertebrates, and serving as a carbonate source. In particular, this species has been found to add approximately 800 grams of calcium carbonate per m^2 to the Maui Nui island complex per year (Friedlander et al., 2008).

While native marine algae is part of a healthy aquatic ecosystem, invasive seaweeds are one of the factors contributing to an overall decline of Hawaii's coral reefs. To date, 12 species of invasive algae have been introduced into Hawaiian waters. They reproduce quickly and outcompete native species for space and food. Invasive seaweeds can overgrow shallow reefs, indicating an imbalance between factors which promote algal growth, such as nutrient availability, and those which control algal abundance, such as grazers like sea turtles and herbivorous reef fish. These algae are difficult to control because of their ability to fragment readily and grow rapidly. The five major algae currently affecting the Hawaiian coral reefs are Smothering Seaweed, Gorilla Ogo, Leather Mudweed, Hook Weed, and Prickly Seaweed.

3.3 Socio-economic Setting

As of September, 2017, the Hawai‘i Department of Labor and Industrial Relations reported that Hawai‘i boasted 656,500 wage and salary jobs (excluding agriculture sector jobs) marking a 7% increase from the same month in 2016. The unemployment rate in 2017 was reported at 2.4% (Hawai‘i Tourism Authority, 2017). The leading job-creating industries that help drive the State’s economy include manufacturing, agriculture, defense, the service industry, and tourism. Tourism is the largest single contributor to the state's gross domestic product, estimated to be valued at about $14 billion, or 21% of the entire state economy. Ocean-dependent businesses and industries in Hawaiʻi represent an important economic contributor to the state's economy, especially those that support the recreation and tourism sector. Other ocean-dependent sectors such as ship and boat building, offshore mineral extraction, commercial fishing and seafood marketing, and the dredging of harbors employ thousands of other workers. In 2013, tourism and recreation accounted for 88 percent, or $6.2 billion of the state's $7 billion ocean-based GDP. Ninety-one percent of employment within the sector provided jobs for 99,000 people in marinas, restaurants, hotels, and boat dealerships. By comparison, tourism and recreation only accounted for 28% of the national ocean economy in 2013, employing 2.2 million people of the 3 million total ocean economy employees (USACE, 2018). This indicates that ocean-related tourism is a large driver to the state's economic outlook.

In November 2018*,* the Hawaiʻi Tourism Authority estimated that there were approximately 240,000 visitors in the Hawaiian Islands spending approximately $48.6 million on any given day (Hawaiʻi Tourism Authority, 2018). The majority of tourism spending was on Oʻahu where visitors spent $22.2 million per day. To a lesser degree, visitor spending on Maui, the Island of Hawaiʻi, and Kauaʻi was estimated to be $13.8 million, $6.5 million, and $5.5 million, respectively, per day. Over the course of the year, these visitors spent $16.2 billion, reflecting an increase of $1.2 billion since 2017 (Hawaiʻi Tourism Authority, 2018).

Beaches are primarily recognized as the backbone of the state's large tourist industry and are perhaps the islands' main tourist draw for the 200,000 visitors in the state each day, so the maintenance of sandy, accessible, and clean beaches is critical (Hawaiʻi Department of Business, Economic Development & Tourism, 2015). A 2008 report from the Hospitality Advisors, LLC (2008) regarding the economic benefits of Waikīkī Beach estimated that the total loss of Oʻahu's Waikīkī Beach would result in an approximately $2 billion reduction in annual visitor spending. The study identified expenditures on beach and water-based recreation alone would be impacted by $8.5 million. Furthermore, 58% of all westbound visitors (North American) indicated they would not consider staying in Waikīkī if the beach was completely lost. The $2 billion reduction from loss of Waikīkī beach would equate to an 18% overall reduction in visitor expenditures for the state as a whole and a loss of 6,352 jobs (Hospitality Advisors, LLC, 2008). This report was updated in 2016 by UH Sea Grant (Tarui, Peng, and Eversole, 2016) and it was found that the estimated potential loss in spending and revenue increased slightly to $2.22 billion. An earlier economic valuation study from 2002 indicated that a congested Waikīkī Beach (due to beach narrowing) could result in a net decrease of approximately 250,000 annual visitors, or 3.6% of total visitors for the state in a year, at an estimated value of $181 million annually (Lemmo et al., 2013). This seems to indicate that a narrower and, therefore, more crowded beach would also have negative economic impacts for the state.

In general, Hawaii's beaches provide commercial, recreational, cultural, and subsistence ecosystem services and also provide habitat for plants and animals that supplement the attractiveness of this important resource. These beaches also enhance property values, are critical for flood and erosion prevention, and protect property from storm waves; therefore, beaches are considered to play a significant role in Hawaii's overall economic condition.

3.4 Cultural Setting

Historically and contemporaneously, beaches and coastal areas are of tremendous significance to Native Hawaiians. These areas were actively utilized and managed by Hawaiians from the time prior to western contact and continue to be of vital importance to the perpetuation of cultural practices today. Healthy beaches are essential to traditional subsistence practices, including fishing and gathering (i.e. limu, pa‘akai). They are also critical to many cultural practices, including but not limited to surfing, paddling, and spiritual ceremonies. As Hawaiians have historically resided along the shoreline areas, it is common to find iwi kūpuna (Hawaiian burials) in coastal areas. Therefore, extreme care should always be exercised when working in coastal areas and invasive methods of preserving shorelines (i.e. shoreline hardening or coastal development) should be avoided whenever possible.

3.5 Natural Hazards

Hawaii's geographic setting and geologic framework exposes the island chain to a wide range of natural hazards. Of these natural hazards, the beaches along Hawaii's sandy shorelines are primarily threatened by tsunamis, high waves, storms, erosion, and rising sea levels. Waves and storms along with the state of sea level rise in Hawai‘i are discussed above in Section 3.1.4 and Section 3.1.5, respectively. The following sections, however, describe the nature of tsunamis and erosion that occur within the state.

3.5.1 Tsunamis

Tsunamis are caused by a displacement of a large volume of water by seafloor movements that generate a series of waves that travel great distances across the global oceans. Causes of seafloor movement that can create tsunami include faulting, landsliding, or submarine volcanic eruptions. Submarine faulting, often consisting of the vertical movement of a block of oceanic crust, may cause seismic tremors known as earthquakes. A tsunami is the result of the faulting, not the earthquake. Landslides originating above or below the sea surface also have the ability to generate a tsunami. Tsunamis pose a significant hazard in the Hawaiian coastal zone.

Generally, tsunamis have an open-ocean wave height of approximately 1 foot and extremely long wave lengths (hundreds of miles long) such that they can travel at speeds of approximately 500 miles per hour. When tsunami waves approach shallow nearshore water, the relatively small tsunami wave increases greatly in height and pushes inland at considerable speed. Tsunamis manifest themselves as either large breaking waves or as rapidly rising sea level like a flooding tide. Orientation, offshore bathymetry, and geography of the shoreline play important roles in the localized impacts of a tsunami. In 1946 and 1960, Hilo Bay experienced extremely large tsunamis (50 feet and 35 feet, respectively) resulting in extensive damages. Unlike storm waves, tsunami waves may be very large in embayments where the waves have the ability to amplify in long funnel-shaped bays. Fringing and barrier reefs appear to have a mitigating influence on tsunamis by dispersing the wave energy. An example of this phenomenon was experienced during the 1946 tsunami within Kāne‘ohe Bay, O‘ahu. The bay was protected by a barrier reef and, therefore, the tsunami reached only 2 feet in height. Meanwhile at the neighboring Mōkapu Head, the wave crest exceeded 20 feet.

Despite complex differences in the geography and orientation of Hawaii's many coastlines, several locations have historically been subject to severe tsunami impacts, including Hilo Bay, Hawai‘i; Kahului Bay, Maui; and Kaiaka Bay, O‘ahu. Most tsunamis in Hawai‘i originate from the tectonically active areas located around the Pacific Rim such as Alaska and Chile. The tsunami waves generated by earthquakes within this region do not reach Hawai‘i for several hours. Accordingly, the network of sensors that is part of the Pacific Tsunami Warning System are able to give Hawai‘i advance warning of tsunami from these locations several hours before the wave train hits. While the majority of tsunamis are generated from these distal areas, tsunamis may also originate from seismic activity in the Hawaiian Islands. These proximate tsunamis, therefore, do not allow significant advanced warning. For example, the 1975 7.2 magnitude Halapē earthquake produced a tsunami wave that reached O‘ahu in less than 30 minutes. According to Dudley and Lee (1998), Hawai‘i experienced a total of 95 tsunamis over the 175 year period between 1813 and 1988.

3.5.2 Erosion

Coastal erosion and beach loss are chronic and widespread problems in the Hawaiian Islands. Typical erosion rates in Hawai‘i range from 15 to 30 cm/yr (0.5 to 1 ft/yr) (Hwang, 1981). Table 1, which is discussed in detail within Section 1.1.2, summarizes long-term erosion rates around Kaua‘i, O‘ahu, and Maui as determined by Fletcher et al. (2012). The chronic erosion along Hawaii's shoreline has resulted in fundamental changes over the recent decades. For example, 17.1 miles of the original 71.6 miles of sandy shoreline present on O‘ahu in the 1940's has either been significantly narrowed or lost (Romine and Fletcher, 2012; Fletcher et al., 1997; Coyne et al., 1996). Considering the importance of erosion across the State of Hawai‘i, especially as it relates to the need for this proposed program, additional data and information are presented in Section 1.1.2 and Section 1.1.3 to describe the present condition and outlook for Hawai‘i beaches.

Causes of coastal erosion and beach loss in Hawai‘i are numerous. Factors contributing to beach loss include: a) reduced sediment supply, b) large storms, and c) sea level rise. Reduction in sand supply, either from landward or seaward (primarily reef) sources, can originate from a range of sources. Sources such as beach sand mining and the construction of coastal structures (e.g. seawalls) that prevent natural access to backbeach deposits remove sediment from the active littoral system. These shoreline hardening structures limit coastal land loss behind the structure but may accelerate land loss fronting structures and along adjacent non-hardened shorelines. Shoreline hardening typically accelerates beach loss on eroding coasts by prohibiting sediment release from the backshore and deposition in front of the structures. Shoreline hardening and resulting beach narrowing ultimately causes waves to break against the structure instead of dissipating on a shallowly sloping beach. The high energy of the wave breaking against the structure inhibits sand accumulation. More complex issues of sediment supply can be related to reef health and carbonate production which, in turn, may be linked to changes in water quality. In addition, large storms have the ability to transport sediment beyond the littoral system. Finally, as described above and discussed in Section 1.1.3 and Section 3.1.5, rising sea level leads to a landward migration of the shoreline.

3.6 Recreational and Aesthetic Resources

Hawaii's beaches offer a wide array of recreational opportunities. Visitors and locals alike utilize beaches for activities such as sunbathing, swimming, surfing, kite surfing, standup paddle boarding, bodyboarding, skimming, canoe surfing, snorkeling, spear fishing, pole fishing, walking, wading, and metal detecting, among others. Some of the beaches on the Main Hawaiian Islands are relatively secluded and draw few visitors. However, some beaches, including those at Waikīkī for example, are relatively busy and provide a range of services catering to the recreational needs of beach goers with surfboard rentals and catamaran rides. Surfing is a major attraction to Hawaii's beaches where, on Oʻahu alone, at least 43 surf competitions have been scheduled for 2019 (Aloha Surf Guide, 2019).

Hawaiʻi is famous for its scenic coastal corridors, and the aesthetic qualities of its coastline have created a desirable tourist destination. A major purpose of the Coastal Zone Management Act (Public Law 92-583, 1972) is the preservation of scenic and aesthetic resources. This objective is particularly important for the State of Hawaiʻi, known world-wide for its natural scenic beauty and unique landscapes. Hawaii's shoreline environments are subject to both terrestrial and marine influences and include dry, mesic or moderately moist, and wet communities depending upon their location and orientation. Historically these areas have been subject to significant alteration by human activities and continue to be affected by land conversion as a result of residential construction, resort development, and agriculture. Today, few undisturbed shorelines remain.

4 ENVIRONMENTAL CONSEQUENCES

Activities that will be eligible for application under the program are limited to beach management, maintenance, and restoration activities that meet the criteria set forth in this PEA, which excludes any activities that would cause significant negative impacts to environmental or cultural resources. Beach restoration activity can have positive and negative biological effects on the many components of the beach ecosystem including water quality, nearshore habitats, nesting and foraging fauna, swimming marine fauna, and other natural resources. In general, any negative effects would be short-term, while long-term effects depend on the ecological recovery of the system, which is influenced by project size and location, techniques employed, sand quality and quantity, and conditions prior to nourishment (Speybroeck et al., 2006). While most environmental assessments only review the harmful effects of programs and projects, this assessment recognizes that restoration projects can have benefits that should also be considered. This section reviews both positive and negative effects of the proposed program. Generally, positive effects of the Proposed Action include increased coastal resiliency through the protection of upland structures and infrastructure, restoration of eroded beach for wildlife habitat utilization, potential benefits to local economies and communities due to increased recreational and cultural opportunities, and restoration of cultural practices.

As required by HAR §11-200-10(6), this assessment evaluates the potential direct, indirect, and cumulative effects of the project alternatives. The Council on Environmental Quality (CEQ) regulations (40 CFR §§ 1508.7 and 1508.8) defines direct effects as those caused by the action that occur at the same time and place. Indirect effects are defined as those caused by the action that occur later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate and related effects on air, water, and other natural systems, including ecosystems.

Cumulative effect is the effect on the environment that results from the incremental effect of a proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. In other words, the combined, incremental effects of an action, referred to as cumulative effects, may pose a serious threat to the environment. While they may be insignificant by themselves, cumulative effects accumulate over time, from one or more sources, and can result in the degradation of important resources. As such, cumulative effects can result from individually minor but collectively significant actions taking place over time. Since 2003, at least twenty-one (21) beach restoration projects have been implemented within the State of Hawaiʻi (OCCL, 2017). These primarily include small-scale beach nourishment projects involving the utilization of less than 10,000 cubic yards of fill material as well as several relatively larger-scale projects (Table 6). Moreover, at least forty-seven (47) beach management projects, such as sand pushing and sand bypassing/backpassing operations, have been constructed since 2003 (Table 7). Additional beach restoration projects are in the process of being planned. Should the proposed action lead to a streamlined permitting approach for small-scale beach restoration activities, it would be anticipated that additional projects would be constructed in the foreseeable future as well.

4.1 No Action: Status Quo

The No Action alternative, as described in detail in Section 2.1, includes the continuation of established beach restoration projects utilizing the existing permitting process. Property owners contending with coastal erosion seeking to implement beach restoration projects currently face a relatively time consuming and expensive permitting effort. However, should these projects be constructed, both positive and negative direct, indirect, and cumulative effects would be realized as a result of the No Action alternative. Certainly, fewer projects would equate to fewer short-term construction related effects (e.g. less short-term turbidity, noise, equipment, etc.). However, there would a disproportionate long-term negative effect from the no action alternative from the opportunity loss of improved beach systems and their ecological, erosion mitigation, and recreational benefits. Once a small-scale beach restoration project is constructed, the shoreline becomes relatively stabilized by the nourished beach that increases the extent of habitat for various flora and fauna that utilize the healthier beach. These include threatened and endangered species such as the green and hawksbill sea turtles and Hawiian monk seal. In addition, a restored beach would result in increased recreational opportunities, a continuation of cultural activities, and socio-economic growth. Water quality could be improved as a result of beach restoration for areas where clay soils are currently eroding into the ocean. In the balance, it appears that the proposed alternative may increase short-term negative effects but will likely increase long-term beneficial ecological and recreational effects which are described in greater detail in Section 4.2 below.

Hawai'i has been characterized as one of the most heavily regulated of all the 50 states (Callies, 2010). The regulatory system is largely borne from a centralized state land use system, the federal regulations to protect public health and the environment, increased public participation in the planning process, and Hawaii's unique environmental and cultural qualities and challenges. Thus, because of the uncertainty of permitting for beach restoration projects in Hawai'i, the permitting process can be arduous, time consuming, and costly (DLNR, 2012). Because of the arduous nature of permitting these projects, often times applicants hire consultants to assist with the development of the required environmental documentation and permit applications. As such, many candidate small-scale beach restoration projects have become unfeasible due to the costly and time consuming efforts involved in securing the required permits. This has been demonstrated as the number of permits issued for small-scale beach restoration projects has decreased to less than one project per year since the streamlined permitting process utilizing the expired SPGP is no longer available.

Therefore, under the No Action Alternative conditions, areas of shoreline that require restoration projects may continue to be left unmanaged and remain susceptible to the impacts associated with erosion and an increased rate of sea level rise. Negative indirect and cumulative effects of the No Action alternative would include the continuation of erosion and resultant loss of habitat for nesting sea turtles, Hawaiian monk seals, and other biota that utilizes Hawaii's sandy beaches. Recreational activities, tourism, and other socio-economic opportunities would also be affected as a result of narrowing beach areas. Furthermore, without the placement of additional sand on eroding beaches, water quality could degrade as a result of eroding soils entering the nearshore waters. Unabated erosion could also lead to the inadvertent exposure of iwi kūpuna (Hawaiian burials) or important subsurface features. As many Hawaiians consider iwi kūpuna to be notably significant, their prolonged exposure is considered a desecration to these resources. Similarly, whereas other historic sites have also been unintentionally unearthed as a result of coastal erosion, the No Action alternative would not facilitate the protection of cultural resources. Furthermore, a reduction of shoreline area also adversely affects cultural resources by reducing the spaces available for traditional and customary practices that require shoreline access. Once beaches erode landward to the edge of vegetation, terrestrial sediments may become exposed to the ocean. Terrestrial sediments in Hawai'i are primarily derived from the erosion of volcanic rocks and typically contain a large fraction of clay and silt, which, when released into the marine environment, may result in elevated turbidity. The erosion of these soils into the nearshore waters may also deliver nutrients and contaminants into the marine environment. These direct effects, however, are primarily limited to periods of time with high surf or following heavy rainfall as demonstrated in Figure 16.

Figure 16. Chronic and seasonal beach conditions (February 2016, left and May 2016, right) (Moffatt & Nichol - Kahana Beach Regional Beach Nourishment Feasibility Study, 2016).

In addition, without a cost and time saving streamlined permitting process for beach restoration activities, many property owners facing coastal erosion issues may opt to construct coastal armoring projects. While shoreline hardening serves to stabilize upland areas and prevent property loss, these projects may result in negative indirect effects. Seawalls and bulkheads often cause additional erosion to the area fronting the armoring and on neighboring properties. These structures, which trap and effectively remove beach sediment from the littoral system, often lead to the complete disappearance of beach fronting the armored shoreline; over 13 miles of beach has been completely lost to erosion on Kaua'i, O'ahu, and Maui, nearly all of which fronted shoreline armoring (Fletcher et al., 2012). On O'ahu, beaches fronting armored shorelines narrowed by 36% on average in comparison to unarmored coasts where beach width remained stable (Romine and Fletcher, 2012). This phenomenon has also been observed on Maui where beaches fronting seawalls narrowed by 50-70% (DBEDT, 2006). Therefore, the reduction of sandy beaches as a result of the construction of shoreline armoring projects would inherently cause additional economic burdens to neighboring property owners and loss of public beach. Along with causing the loss of sandy beaches, these shoreline armoring projects also indirectly affect local communities and the state's tourism-based economy by reducing public access to the beach and beach-related recreational benefits.

The No Action alternative may also pose additional economic burdens on private property owners due to the fact that the owners of coastal properties must obtain easements for structures that were originally constructed on private property but are now located on state owned land due to the landward migration of the shoreline. The Attorney General of Hawaii issued a formal advisory opinion on December 13, 2017; when the shoreline migrates landward due to erosion or sea level rise, the dividing line between public and private ownership also migrates landward. Moreover, the Attorney General's advisory opinion also states that the Board of Land and Natural Resources should charge former owners fair market value in return for an easement interest in the land. Therefore, because the existing permitting scenario to implement a beach restoration project under the No Action alternative can be a lengthy process, some property owners may be required to obtain an easement for shoreline structures due to landward migration of the shoreline.

4.2 Proposed Action: Small Scale Beach Restoration Program

The proposed action, as described in greater detail in Section 2.2, includes the development of a streamlined regulatory process that facilitates the management, maintenance, and restoration of existing and historic beach systems across Hawai'i. Projects eligible under this program would entail beach management operations (sand pushing, bypassing, and backpassing), beach maintenance operations (i.e. recovery, transport, and placement of beach compatible fill), and the construction of beach stabilization structures. The potential negative and positive direct, indirect, and cumulative effects anticipated for the human environment as well as the abiotic and biotic components of the coastal system associated with the Proposed Action alternative are described in detail below.

4.2.1 Physical Effects

Aspects of the physical environment may be influenced by the implementation of the proposed action. However, neither the region's climate, temperature, wind, nor tides will be affected by the implementation of the Proposed Action. Therefore, these aspects will not be assessed further below. However, effects derived from sea level rise, noise, air quality, and water quality may be realized and therefore are discussed in detail below.

4.2.1.1 Sea Level Rise

Direct Effects: The effect of sea level rise induced erosion, inundation, and increased coastal vulnerability, as detailed in Section 1.1.3 and Section 3.1.5, may be offset by the implementation of the Proposed Action alternative. Moreover, maintenance of the upper shore face profile allows for additional positive effects, including the continuation of recreational opportunities and the utilization of this habitat by a number of protected species. The implementation of actions that place additional beach quality fill from offshore or upland sources on beaches due to the streamlined permitting process will serve to mitigate the long-term effects of sea level rise. Actions such as sand pushing, backpassing, and bypassing do not add additional material to the littoral cell; therefore, beneficial effects with regards to sea level rise associated with these actions are short lived as they do not address sea level rise related losses.

Indirect Effects: Under normal conditions, the upper shore face (the morphologically active part of the coastline that extends vertically from the berm ridge to the depth of closure) maintains a profile that is in equilibrium with its physical environment. Any perturbation in the physical environment, such as changes to the sea level, will elicit a response to the beach profile. This phenomenon has been described by Bruun (1962) and Davidson-Arnott (2005), among others. In general, when sea level rise occurs the shoreline retreats landward and upward as the profile adjusts to achieve equilibrium, resulting in a narrower beach area if backshore development or geology restrict landward migration of the beach system. A study by Anderson, et al. (2015) suggested that rising sea levels will result in the retreat of 92% of the Hawaiian shorelines included in their assessment by the year 2050 with shoreline recession rates nearly doubling compared to extrapolation of historical trends alone. Therefore, beaches in Hawai‘i that are not managed to protect or restore the historic shoreline will experience increased sea level rise induced erosion. As such, the implementation of the Proposed Action would reduce negative effects attributed to rising sea levels along the beaches of Hawai‘i.

Cumulative Effects: In the coming decades, rising sea levels in Hawai‘i are expected to result in increased chronic flooding of low-lying coastal areas and increased vulnerability of coastal regions to flooding from less-frequent storm surges, tsunamis, and extreme astronomic tides. As sea level rises, storm surge and wave run-up of a given magnitude are expected to reach higher elevations on the coast and produce more extensive inundation. Rising sea level would cause more frequent exceedances of elevation thresholds that, in turn, would lead to greater occurrences of waves breaking over seawalls and storm surges overwashing natural beach berms and dunes. The Proposed Action alternative includes the implementation of beach restoration projects under a streamlined permitting process, which would mitigate the continuation of erosion and beach narrowing along shorelines that otherwise would not receive a small-scale beach restoration project.

4.2.1.2 Noise

Direct Effects: During the land-based and offshore construction activities associated small-scale beach restoration projects, noise levels have the potential to increase above the ambient levels. These increased noise levels would be experienced at the beach project sites and borrow areas due to the presence of construction equipment and personnel. On land, noise levels will be elevated during the construction of accessory structures and the placement of fill on the beaches due to the presence of heavy machinery such as front-end loaders, excavators, and bulldozers. Material obtained from upland sources may be trucked to the beach fill site resulting in increased noise from diesel engines. Offshore, marine dredging produces broadband, continuous, low frequency sound that can be detected over considerable distances and may trigger avoidance reactions in marine mammals (Thomsen et al., 2009) and other organisms. The sound produced is dependent on many factors including, but not limited to, substrate type, sediment type being dredged, type of equipment used, and skill of the dredge operator. The variation in noise emitted by equipment type is related to how the machinery makes contact and extracts material from the sea floor. Clarke et al. (2002) performed a study of underwater noise produced by various types of dredging equipment, including a hydraulic cutter suction dredge and a trailing suction hopper dredge. Recordings of a hydraulic cutter performing maintenance dredging in Mississippi Sound, Mississippi emitted noise as the cutterhead was turned at 1 – 10 rpm within the substrate. Sounds were continuous and fell within the 70 to 1,000 Hz range while sound pressure levels peaked between 100 to 110 dB re 1µPa rms. In the case of a hopper dredge, much of the sounds emitted during the active dredging process are produced by propeller and engine noise, pumps, and generators. Similar to a cutter suction dredge, most of the sound energy produced fell within the 70 to 1,000 Hz range and was continuous in nature. However, Clarke et al. (2002) reported peak pressure levels recorded by a listening platform ranged from 120 to 140 dB re 1µPa rms for hopper dredges, which is comparatively much higher than that recorded for a cutter suction dredge. A more recent study evaluated sound levels produced by hopper dredges operating in an offshore environment during sediment excavation, transport of material, and pump-out of material (Reine et al., 2014). When averaged across all dredging activities, sound pressure levels (SPLs) averaged 142.31 dB at a distance of 50 meters, and grew progressively less to 120.1 dB at 1.95 km. At all distances from dredging activity, sound levels were highest during sediment removal activities and transition from transit to pump-out, and were quietest during flushing of pipes at pump-out (132.45 dB). At a distance of 2.5 km, sounds attenuated to ambient levels. Smaller dredges, namely bucket/clamshell dredges and smaller hydraulic dredges potentially used for projects covered under this program, produce less noise effect compared to the aforementioned cutter suction dredges and hopper dredges used for larger restoration projects constructed on the mainland. Bucket dredges produce a repetitive sequence of sounds generated by winches, bucket impact with the substrate, bucket closing, and bucket emptying. The noise generated from a mechanical dredge entails lowering the open bucket through the water column, closing the bucket after impact on the bottom, lifting the closed bucket up through the water column, and emptying the bucket spoil into an adjacent barge.

Noise levels will only be elevated during active construction and will return to pre-construction levels upon project completion. Noise effects are expected to be minimal and of little significance due to the inclusion of BMPs, which includes the use of suitable mufflers to ensure compliance (see Section 5.5). Furthermore, noise levels will be kept within acceptable levels at all times in conformance with HAR Title 11 § 46 Community Noise Control, State Department of Health, Public Health Regulations.

Indirect Effects: Sound plays an important role in the marine environment, but the function of sound in the ecology of many marine animals is not entirely understood. The extraction of sand from the marine environment produces sound that elevates levels above ambient and may disturb or cause injury to some marine fauna such as invertebrates, fishes, marine mammals, and sea turtles. For example, in marine cephalopods, exposure to low-frequency sound was found to cause acoustic trauma to sensory structures responsible for the animals' sense of balance and position (Andre et al., 2011). Studies suggest that the effects of dredging sound on pinnipeds may be limited. Between 2002 and 2003, during observations of dredging operations in Geraldton, Western Australia, it was reported that New Zealand fur seals and Australian sea lions showed no sign of disturbance reactions, despite the relative closeness of the dredging to popular haul-out sights (EPA, 2007). Similarly, Hawaiian monk seals showed no adverse reactions to bucket dredges around Tern Island (Gilmartin, 2003).

Sound can also prove detrimental to fishes, especially those considered "hearing specialists" that have specialized hearing structures and those with swim bladders. The frequency and sound levels emitted by dredges overlap the range of hearing for some fish species, meaning dredging can cause adverse effects such as behavioral changes or physiological damage (Thomsen et al., 2009).

In general, the noise emitted by dredging is broadband, with most energy below 1 kHz, and is therefore unlikely to cause damage to marine mammal auditory systems. However, the noise disturbance created by heavy machinery may temporarily drive marine mammals (namely whales) and other organisms from their foraging or nesting activities (Speybroek et al*.,* 2006). Because these potential indirect effects are temporary, combined with the fact that the organisms are mobile and can avoid areas of high noise, no significant indirect effects are anticipated.

Cumulative Effects: If a streamlined permitting approach is established for small-scale beach restoration projects, it can be assumed that an increased number of projects will be initiated in the near future compared to the existing permitting landscape. However, as demonstrated by individual projects constructed in the recent past, due to the short-term temporary nature of these relatively minor noise effects, significant cumulative effects are not anticipated.

4.2.1.3 Air Quality

Direct Effects: A temporary reduction in air quality will occur as a result of emissions created by the engines and generators utilized in the construction of small-scale beach restoration projects. Specifically, these direct effects will be a result from the use of marine-based dredges and support vessels as well as shore-based construction equipment such as loaders, dozers, pumps, trucks, and forklifts. The primary emissions would result from the burning of fossil fuels by this equipment. These emissions include carbon monoxide (CO), nitrogen oxides (NOx), volatile organic compounds (VOCs), directly-emitted particulate matter (PM10 and PM2.5), and toxic air contaminants such as diesel exhaust particulate matter. Sulfur dioxide (SO2) is generated by oxidation during combustion of organic sulfur compounds contained in diesel fuel. Off-road diesel fuel meeting federal standards can contain up to 5,000 parts per million (ppm) of sulfur, whereas on-road diesel is restricted to less than 15 ppm of sulfur. Variables that affect ambient air quality include the number of hours the fossil fueled vehicles and machinery operate, the amount of material recovered (dredged,), the distance from shore at which the dredge operates, and meteorological conditions (e.g. wind velocity and direction). Generally, the dredge produces the majority of emissions during a nourishment project. During truck-haul operations, dust will be prevented from becoming airborne through the use of dust-preventing measures including sprinkling.

In general, the negative effects to air quality will be limited to typical work hours and will end once the construction is completed. Furthermore, due to the inclusion of BMPs that require all construction vehicles to employ emission control devices (see Section 5.4) air quality effects will be minimized even further, thereby resulting in no significant direct effects.

Indirect Effects: Because air quality effects are anticipated to be minimal and only present during construction, no indirect effects are anticipated as a result of the implementation of the Proposed Action.

Cumulative Effects: If a streamlined permitting approach is established for small-scale beach restoration projects, it can be assumed that an increased number of projects will be initiated in the near future compared to the existing permitting landscape. However, as demonstrated by individual projects constructed in the recent past, air quality effects are short-term and relatively minor in nature. Therefore, cumulative effects are not expected.

4.2.1.4 Water Quality

Direct Effects: Under the Proposed Action alternative, temporary direct water quality effects would be anticipated during the construction of small-scale beach restoration projects. However, by adhering to the various BMPs designed to reduce water quality impacts, as stated in Section 5.6, these activities are not expected to result in significant direct adverse effects to water quality in the nearshore or offshore marine environment. The direct effects associated with the Proposed Action alterative are described below.

<u>Beach Fill Recovery and Transport Activities</u>
The main effects on water quality as a result of recovering uncontaminated sediment are localized temporary increases in turbidity and suspended sediment concentrations. Turbidity is a parameter related to water transparency. It is a measure of light scattering by suspended particles such as silt, clay, organic matter, plankton, and microscopic organisms. Total suspended sediment (TSS) (mg/L) is a measure of all solid particles suspended in the water column. The resuspension of bottom sediments during sand recovery events at borrow sites may differ in terms of duration and intensity compared to the resuspension that occurs naturally during storms or tidal flows (Wilber and Clarke, 2001).

Depending on the type of dredge being used, temporary sediment plumes will arise from various sources during recovery operations. In the case of a hopper dredge, sediment re-suspension will result as the draghead moves over the seafloor, as well as during the discharge of overflow while filling the hopper. Sediment re-suspension that results from overflow as the hopper is being filled generally only occurs during a portion of the filling time. The time required to fill a hopper (fill cycle) can vary, but on average may take 45 minutes to one hour when dredging sandy substrates. The first third of the cycle involves filling the hopper with sand and water. For the remaining fill cycle, sand replaces the water in the hopper, and the water sporadically overflows back into the ocean. Turbidity plumes can also be created sub-surface at the drag head site. These plumes are localized to the immediate vicinity of the drag head and typically do not reach the surface (LaSalle et al., 1991). The sediment plume generated by hopper dredging has been shown to extend 1,640 to 4,000 feet from the dredge and is generally reported to be short-term (Hitchcock et al., 1999; Anchor Environmental, 2003; Roman-Sierra et al., 2011). Suction pipeline dredges generate comparatively lower amounts of suspended sediment and plumes are confined to within a few meters of the suction head at the seafloor. A suction dredge functions by agitating the surface of the substrate; therefore, the sediment plumes created from the suction dredge are generally highly localized (CSA et al., 2009). Additionally, the material is hydraulically moved from the suction head/sediment interface directly into a pipeline, eliminating the hopper-filling stage and associated overflow. Although unlikely, a leaking submerged pipeline can also be a source of elevated turbidity (Michel et al., 2013). Anchoring the pipeline will reduce the likelihood of abrasion-related puncturing of the pipe, which could result in the release of sediments leading to increased turbidity.

It is anticipated that the recovery activities associated with the proposed project would have only minor effects to the marine water column at the borrow areas. The length and shape of the turbidity plume generated by the sand recovery activity depends, in part, on the hydrodynamics within the water column as well as the sediment grain size. In sandy substrates typical of borrow sites, the grain size is larger and the extent of sediment suspension is therefore more restricted. The borrow areas utilized for any small-scale beach restoration project will be composed of compatible beach quality fill with low organics and biological oxygen demand. Therefore, re-suspended material is expected to have a quicker settling time, thus having no appreciable effects on the dissolved oxygen, pH, or temperature. Additionally, the hydrodynamics of the open-ocean environment at borrow sites allows adequate mixing with oxygen rich surface waters.

Dredging activities often generate no more increased suspended sediments than commercial shipping operations, bottom fishing, or that generated during severe storms (Parr et al., 1998). Furthermore, natural events such as storms, floods, and large tides can increase suspended sediments over much larger areas and for longer periods than dredging operations (Environment Canada, 1994). Studies conducted by Van Dolah et al. (1992, 1994) found that dredging appeared to have little effect on bottom turbidities at various borrow sites. One site examined by Van Dolah experienced high turbidity levels during sampling, but these levels were also observed prior to dredging (Van Dolah, 1992). It is therefore often very difficult to distinguish the effects of dredging on water quality from those resulting from natural processes or normal navigation activities (Pennekamp et al., 1996).

Beach Fill Placement Activities

Beach restoration activities typically involve the placement of additional material onto recipient beaches originating from either upland sources or marine based borrow areas. Generally, when an upland source is used, the fill is delivered to the recipient beach via trucks and dumped directly onto the existing beach berm or within the swash zone. Material obtained from a marine based borrow area is typically delivered to the recipient beach from the dredge via pipeline as a sand slurry. The placement of material on the beach from both upland and marine based sources would likely result in temporary levels of increased turbidity within the surf zone. The larger particles within the slurry settle out rapidly; however, the finer sediments remain suspended for longer periods (Adriaanse and Coosen, 1991). This temporary increase in turbidity as a result of placement of recovered material on recipient beaches has been demonstrated within a number of studies.

Several studies suggest that the resultant sediment plume may temporarily extend within the swash zone well over 1,000 feet from the discharge pipe, depending on the physical conditions at the placement site and circulation patterns within the nearshore waters. Generally, however, this elevated turbidity dissipates rapidly on the order of hours following placement (Shubel et al., 1978; Burlas et al., 2001; Wilber et al., 2006). At Mā‘alaea in Maui approximately 3,000 cubic yards of fill was placed within the swash zone at the Kanai A Nalu condominiums. A water quality monitoring effort suggested that the pre-nourishment conditions contained very high background levels of turbidity, especially during high wave events, due to the exposed clay bank on the eroded shoreline. Of the water quality parameters monitored during the study (turbidity, temperature, salinity, and dissolved oxygen), turbidity was the only parameter that appeared to be affected by the sand placement. Turbidity levels during construction increased by 2.22 nephelometric turbidity units (NTU), on average, over preconstruction levels (Norcross et al., 2004). These levels, however, returned to pre-nourishment levels within 5 days following the completion of the project. Furthermore, within one month of the project's completion, the turbidity values returned to the low levels observed in previous years before the site was characterized with clay soils eroding into the nearshore waters. Therefore, the placement of fill within the swash zone and on the beach berm at Māʻalaea seems to have effectively removed the natural turbidity source (eroding clay soil) and suppressed background turbidity levels by covering fine sediment layers that are prone to disturbance and suspension (Norcross et al., 2004). This phenomenon of improved nearshore turbidity conditions following beach nourishment projects was also demonstrated at Sugar Cove on Maui. The construction of more than 20 beach restoration and berm maintenance projects at Sugar Cove over recent years have effectively served to better cover the natural clay bank and mitigate turbidity than that accomplished by the now buried sloping revetment. These actions have helped prevent the release of the finer clay material into the nearshore waters which otherwise would have resulted in elevated turbidity. Therefore, as demonstrated by the projects at Māʻaleaa and Sugar Cover, beach restoration projects may result in temporary elevated turbidity levels during construction as the fine material settles out of suspension. However, once the eroding shoreline is covered with sand, the direct effects to water quality may ultimately be positive as turbidity levels decrease below the erosion-induced high pre-construction turbidity levels.

The fill placed along the shorelines for small-scale beach restoration projects will be required to meet a series of beach compatibility standards, including a target of 2% fines or less, which will serve as BMPs for water quality. By adhering to these standards, potential turbidity plumes would be expected to be temporary in nature as the fines settle out relatively rapidly. Furthermore, turbidity control measures, such as the construction of temporary shore-parallel or shore-perpendicular dikes, can encourage fine material to settle out from the slurry before the water returns to the ocean. All fill placed for the purpose of beach nourishment must comply with Department of Health, Clean Water Branch regulations (Chapter 11-54, Hawaiʻi Revised Statues) adopted pursuant to the Federal Clean Water Act.

Effects from project-related sedimentation should be compared to appropriate background values. It should be noted that ambient turbidity varies within the nearshore waters of Hawaiʻi and is dependent upon weather factors such as wind, wave conditions, and precipitation (i.e. runoff). On many narrowed and degraded beaches in Hawaiʻi, erosion of soil and other fine sediments from backshore lands releases turbidity-inducing fine sediments into nearshore waters during high wave and high tide events and rainfall surface runoff. Given this fact, combined with permit conditions (BMPs) that are often implemented to reduce water quality impacts, the implementation of sand placement activities is not expected to result in significant direct adverse effects to water quality in the nearshore or offshore marine environment and may improve water quality in areas experiencing backshore erosion of soils and clay.

Beach Management Activities

Sand Pushing, backpassing, and bypassing will involve the relocation of sand from one portion of the beach within a littoral cell to another. During the construction process and as this native sand spreads and equilibrates, material may enter the nearshore waters. Due to the relatively small volumes of fill involved with these activities combined with the fact the material originates from the native beach, it is unlikely that the movement of this material onto other portions of the beach will result in an increase in turbidity or any other negative direct water quality effects. As stated above, the fortification of any eroded shorelines where the underlying soils are currently exposed to tidal forces or wave action through sand pushing, backpassing, and bypassing will serve to reduce the naturally occurring turbidity resulting in positive direct effects to water quality.

<u>Beach Stabilization Structures</u>
Water quality may be temporarily directly affected by increased turbidity during the construction of beach stabilization structures such as groins and nearshore breakwaters. The turbidity effect, however, would be considered to be minor as it would be localized and would dissipate rapidly following construction. Because permit conditions would require that any materials utilized to construct these structures would be free of contaminants, no other direct water quality effects would be anticipated.

Indirect Effects: Turbidity and sedimentation within nearshore waters resulting from eroding shorelines may indirectly affect organisms found in the nearshore communities of Hawaiʻi. A study by Weber et al. (2006) concluded that corals may become stressed by silt-sized nutrient-rich terrestrial sediments. Furthermore, fine suspended material introduced to the nearshore waters through coastal erosion has the ability to clog fish gills, reduce resistance to disease in fish, lowering growth rates, and affecting egg and larval development (Berry et al., 2003). When these fine particles settle, they can smother bottom-dwelling benthic invertebrates (Berry et al., 2003). Unexpected sedimentation could cause adult fish to avoid the area and fail to spawn, which could affect population numbers if an alternate site is not found. In addition, Berry et al. (2003) describe a number of studies where birds avoided waters with increased turbidity, expressing a preference for clearer waters. Decreased water clarity might influence bird species to abandon forage or nesting areas.

Beach management (sand pushing, backpassing, and bypassing) and beach maintenance (recovery, transport, and placement of beach quality fill) activities and the construction of beach stabilization structures – all of which may occur as a result of the Proposed Action alternative – may also impose a number of indirect effects to various aquatic resources due to construction-related increases in turbidity and subsequent sedimentation. These effected resources include benthic organisms such as corals, amphipods, isopods, decapods, polychaetes, mollusks, and others. Some studies that examined the response of these organisms to turbidity and sedimentation have noted the following: 1) suffocation of benthic animals from heavy silt loads; 2) difficulty in locating and capturing food by filter-feeders as a result of increased non-nutritive particles in suspension; 3) reduced microalgal production for the duration of active recovery and placement of material in the swash zone; 4) changes in water chemistry; and 5) decreased light penetration (Brehmer, 1965; Courtenay et al., 1974; Johnson, 1982; Naqvi and Pullen, 1983). During many of these proposed small-scale beach restoration activities, sediment will eventually settle out along the sea floor, which can lead to unsuitable fish spawning and egg hatching areas, as well as death to microscopic plants (Brehmer, 1965). Along with filter feeders, deposit feeders may also be negatively indirectly affected by the increase in inedible particles along the seafloor. During recovery operations, it is possible that suspended sediment levels will become elevated and silt and clay particles will increase at the expense of suspended organic material, which results in less available planktonic food sources. A lack of suspendable organic matter that is typically present in the water column can be a limiting factor affecting the survival of existing organisms and recolonizing larvae at the marine dredging site (Zajac and Whitlach, 1991; Berge and Valderhaug, 1983). Increased sedimentation and turbidity can also reduce adult coral fecundity (Kojis and Quinn, 1984) and interfere with reproductive timing and egg-sperm interactions (Jokiel, 1985; Richmond, 1995). Even moderate changes in turbidity can significantly alter photosynthesis/respiration ratios for corals (Telesnicki and Goldberg, 1995).

Along with potential effects to benthic organisms, suspended materials can affect fish by clogging gills, reducing resistance to disease in fish, lowering growth rates, and affecting egg and larval development (Berry et al., 2003; Germano and Cary, 2005). The most sensitive fish resources are the eggs of benthic fish that are unable to attach, grow, or hatch because of sedimentation (Berry et al., 2003). Pelagic fish eggs and juvenile fish could be affected because they settle on the bottom where sedimentation would affect them. Clarke and Wilber (2000) reviewed available data on the effects of suspended sediments to fish and shellfish and found that the duration of exposure was a critical aspect in determining mortality of eggs and juvenile fish species. Unexpected sedimentation could cause adult fish to avoid the area and fail to spawn, which could affect population numbers if an alternate site is not found.

Changes in the ambient water quality can also potentially affect terrestrial organisms such as birds. Berry et al. (2003) describe a number of studies where birds avoided waters with increased turbidity, expressing a preference for clearer waters. Decreased water clarity might influence bird species to abandon forage or nesting areas.

Although these various indirect effects as a result of altered water quality are possible, they are not anticipated to be significant. Most sessile benthic organisms are hardy enough to withstand temporary sedimentation (e.g. from storms and high waves) and, while benthic fish can have strong attraction to certain substrate types, they are also capable of relocating to adjacent suitable areas (Germano and Cary, 2005).

Some positive indirect effects of altered water quality may also be realized due to the implementation of the Proposed Action. Studies that have documented an increase in fish abundance have attributed the increase to the release of nutrients and infauna that occur when sediment is removed from marine borrow areas (Saloman, 1974; Courtenay et al., 1980; Turbeville and Marsh, 1982; Nelson and Collins, 1987). In addition, a study by Van Dolah et al. (1992) found an increase in larval fish abundance at one mine site, which led researchers to believe that elevated turbidity had a positive effect on larval fish recruitment.

In addition, as a result of the streamlined permitting process for small-scale beach restoration projects, it is anticipated that there will be an increase of projects constructed on an annual basis in the future compared to existing conditions. This would result in a net increase of sand placed along eroding shorelines within the state which would thereby serve to curtail the direct release of eroding clays and soils into the nearshore waters during high wave action or following heavy rainfalls that would otherwise result in elevated turbidity, sedimentation, and elevation of nutrients in the water column.

Cumulative Effects: As demonstrated by individual projects constructed in the recent past, these effects to water quality are short-term and relatively minor in nature. Even with an increase in beach restoration projects with a streamlined permit process, cumulative long-term effects are not expected because the SSBR program does not allow placement volumes to exceed the maximum amount permitted by the program in individual littoral systems. However, beneficial cumulative effects may be realized if the Proposed Action results in an increased number of beach restoration projects that include the placement of beach compatible fill on eroding shorelines. As stated above under indirect effects, the placement of this material may serve to eliminate the release of eroding clays and soils into the nearshore waters that would otherwise elevate turbidity, cause sedimentation, and deliver nutrients into the water column (see Figure 16 above).

4.2.2 Biological Effects

The No Action alternative and the Proposed Action may directly, indirectly, or cumulatively affect a wide range of biological resources, however, under the program guidelines, no significant negative effects to biological resources are anticipated. On the contrary, some positive effects may be realized through the creation of habitat and the reduction of threats to water quality. These resources include a number of threatened and endangered species (and associated critical habitat), essential fish habitat, and a wide range of functional groups including corals, algae, fish, and birds. These potential effects are assessed below.

4.2.2.1 Endangered and Threatened Species

4.2.2.1.1 Reptiles

<u>Sea Turtles</u>

Green sea turtles (Central North Pacific DPS) and hawksbill sea turtles primarily utilize the nearshore waters surrounding the Main Hawaiian Islands to swim, rest, and forage. Limited nesting is also reported for these species along the coasts of the Main Hawaiian Islands. Therefore, the assessment below will consider direct, indirect, and cumulative effects to the nearshore marine habitat and nesting habitat of green and hawksbill sea turtles.

Direct Effects: The proposed projects may include beach management, beach maintenance, or beach stabilization activities. Recovery operations conducted as part of beach maintenance pose threats, such as vessel strike, entrainment, or entanglement, to swimming sea turtles. Sea turtle take has been associated primarily with the use of hopper dredges, while hydraulic suction dredges do not appear to significantly affect sea turtles (CSTC and NRC, 1990). Incidental takes of sea turtles have only been documented from hopper dredge operations that use trailing suction drag heads. Thus far, no incidental takes of sea turtles have been reported from clamshell, pipeline suction, or other types of dredges operating along southeastern coasts (Dickerson et al., 2004).

Eligible activities under the proposed program may also include the use of in-water vessels for construction, which have the potential to affect swimming sea turtles either by vessel strikes, mechanized machinery injuries, or by noise and/or vibrations. During both the use of in-water vessels and beach nourishment in nearshore waters, sea turtles may be temporarily deterred from utilizing these areas to avoid the noise, potential injury, and turbidity.

Beach stabilization structures have the potential to interfere with nesting females by restricting or impeding access to the beach. These structures may also interfere with hatchlings as they commence their beach-to-ocean crawl, entrap them once they enter the water, or concentrate predatory fishes which could result in higher probabilities of hatchling predation. However, the projects included in this PEA are intended to have negligible affects to sea turtles and other marine organisms.

Artificial lighting can also affect sea turtle nesting and hatchling behavior. Artificial lighting on the beach and in the water tends to deter sea turtles from emerging from the sea to nest (Witherington and Martin, 1996) and can also result in hatchling disorientation. Following beach nourishment projects, the wider and flatter beach berm may expose turtles and their nests to artificial lighting that was less visible, or not visible at all, from nesting areas before the project leading to greater hatchling disorientation and possible mortality (Trindell et al., 2005). Hatchlings use visual cues to locate the sea once they emerge from the nest and can be misdirected by artificial lighting (Dickerson and Nelson, 1989; Nelson et al., 2000; Lorne and Salmon, 2007). Emerging hatchlings may be attracted away from the shortest path to the water and instead crawl or swim toward the bright lights of a nearshore dredge or anchored pumpout barge (instead of crawling or swimming seaward toward the open horizon), thus increasing their exposure time to predation (NMFS, 2003).

The projects will implement the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* (NMFS, 2006) and the BMPs listed in Section 5.8, which will minimize or eliminate potential effects to swimming sea turtles. In addition, the implementation of the Proposed Action will include the use of visual surveys for ESA-listed species prior to the start of work each day to ensure that no protected species or nests (including sea turtles) are in the area. Should a sea turtle be observed in the immediate vicinity of active construction, work will be halted until the animal leaves the area.

Sea turtles may also benefit from the proposed projects by gaining accessibility to a greater area of beach on which to haul-out and nest. Sea turtles may elect not to nest on critically eroded beaches and abandon sections of beach if they determine that the nest location will not be suitable. In this instance, nesting sea turtles may return to the ocean to find another more suitable location. The proposed projects will repair eroded sections of beach and may widen the dry beach to provide additional nesting habitat as well as additional protection from storms. A nourished beach that is designed and built to mimic the natural beach system will likely benefit nesting sea turtles more than the eroded beach it replaces. As such, the Proposed Action will be expected to increase the number of healthy beaches which serve as sea turtle nesting habitat and, therefore, would result in positive indirect effects.

Indirect Effects: Indirect effects of beach nourishment for nesting sea turtles may be beneficial or adverse, depending on the project design and material used. In the short-term, a nourished beach may hinder sea turtle nesting success due to escarpment formation, compaction, or an unfavorable sand color. These physical changes may occur if the grain size, color, and moisture content of the fill material do not resemble that of the natural beach. These changes in the beach environment can lead to false crawls by the nesting females by making the beach unfavorable or inaccessible for nesting (Nelson, 1988; Wood and Bjorndal, 2000). Nesting females may also deposit nests in unfavorable locations (i.e. below MHW), which can lead to nest washout. Studies have also shown that sex ratio of hatchlings in a nest is influenced by temperature. As a result, sand that is an inappropriate color may raise or lower nest temperatures, potentially altering the sex ratio of hatchlings (Nelson, 1988). The potential for these indirect effects will be mitigated by requiring placement of sand that is a close match for the existing beach following the requirements stated in Section 5.6 of this PEA. Beach nourishment projects can also indirectly affect swimming sea turtles by affecting nearshore foraging habitat if sedimentation occurs in the nearshore waters adjacent to the project areas.

Cumulative Effects: As stated above, past and current threats to sea turtles are abundant. Threats on a global scale include climate change and sea level rise, which may lead to increased storm activity. On a more localized scale, the proposed projects, in conjunction with cumulative effects from previous and ongoing projects, could result in increased vessel traffic leading to potential vessel strikes, increased marine debris, and exposure to wastes, discharges, elevated noise and turbidity levels. Also, increased sedimentation or scouring may affect the nearshore foraging habitat of sea turtles. However, as demonstrated by previous projects under the SSBN program, only temporary short-term direct effects were incurred. Therefore, no cumulative effects are anticipated.

4.2.2.1.2 Marine Mammals

<u>Hawaiian Monk Seal</u>

Direct Effects: Monk seals are very sensitive to human presence. They can become agitated and sometimes aggressive if people approach too closely or are too loud. In the water, they are highly mobile and therefore would have the ability to avoid collisions with dredges or other construction-related vessels. Disturbing them on the beach may also interrupt their resting period. They need to conserve their energy to hunt and reproduce. A mother seal may even abandon her pup if she is bothered, and every pup's survival is important for the recovery of the species. Therefore, construction activity associated with the Proposed Action alternative may disrupt any monk seals present on the beach within a project area and lead to direct effects. However, these effects may be minimized as a result of the implementation of a number of BMPs, as listed in Section 5.8. These include the use of visual surveys for ESA-listed species prior to the start of work each day to ensure that no protected species (including the Hawaiian monk seals) are in the area. Should a monk seal be observed, work activity will be immediately halted until the animal leaves the area. These direct effects, therefore, would be temporary and short-term.

Indirect Effects: Hawaiian monk seals generally need sandy or rocky beaches where they can haul-out for resting, pupping, and nursing. Females prefer to pup on sandy beaches in areas with shallow, protected water near shore. Though their main breeding areas have historically been in the Northwest Hawaiian Islands, rapid erosion and sea level change are reducing haul-out and pupping locations vital to the seals' survival. Because projected sea level change is expected to limit the availability of Hawaiian monk seal habitat in the Northwestern Hawaiian Islands, the Main Hawaiian Islands are now becoming a critical refuge for the monk seals. However, the increased number of small-scale beach restoration projects constructed along the Main Hawaiian Islands, as expected under the Proposed Action alternative, will increase the number of healthy beaches which would serve as additional haul-out habitat for the monk seal and, therefore, would result in positive indirect effects.

Cumulative Effects: As sea levels continue to rise the Hawaiian monk seal's natural haul-out habitat will become increasingly scarce. However, the implementation of the Proposed Action will help mitigate for the loss of this habitat through the creation of additional beach area via beach restoration efforts. As such, the Proposed Action is anticipated to result in a positive cumulative effect on Hawaiian monk seals.

<u>Insular False Killer Whale</u>

Direct Effects: NMFS identified activities that may adversely affect the essential features of critical habitat and, therefore, may require "special management considerations or protections" for the insular false killer whale. These activities include, but are not limited to, the following: (1) in-water construction; (2) activities that contribute to water pollution; (3) military activities; (4) energy development; (5) aquaculture/mariculture; (6) environmental response activities; and (7) fisheries (NMFS, 2017g).

The Proposed Action alternative would involve in-water construction and activities that contribute to water pollution (i.e. recovery, transport, and placement of beach compatible fill, construction of beach stabilization structures, etc.). The majority of the in-water construction activities associated with this alternative would not be performed in the Main Hawaiian Islands IFKW critical habitat (depths greater than 45 m). Because Main Hawaiian Islands IFKW are highly mobile, accidental collisions with dredges or other construction-related vessels would be rare. The negative direct effects on the species as a result of in-water construction would, however, be derived primarily through the generation of construction-related noise. Anthropogenic noise is considered a threat due to the highly complex acoustic sensory system this species possesses, similar to other toothed whales. Chronic anthropogenic noise may affect their ability to detect or interpret important acoustic cues that are vital to their ability to forage, reproduce, socialize, travel, and avoid predators (NMFS, 2017g). Any potential noise effects would be minimized due to the inclusion of BMPs (Section 5.5). See Section 4.2.1.2 for more information regarding noise effects.

In terms of water pollution, the greatest concern to Main Hawaiian Islands IFKW critical habitat are those activities that may reduce water or prey quality by increasing persistent organic pollutants or other chemicals of emerging concern, heavy metals, pathogens, or naturally occurring toxins in Hawaii's surrounding waters (NMFS, 2017g). While recovery activities associated with the Proposed Action alternative may contribute to increased turbidity and sediment loads in the nearshore waters, no direct effects to Main Hawaiian Islands IFWK or its critical habitat would be expected due to the fact that the effects would be temporary and short-term.

Indirect Effects: No indirect effects to Main Hawaiian Islands IFKW or its critical habitat would be anticipated under the Proposed Action.

Cumulative Effects: No cumulative effects to Main Hawaiian Islands IFKW or its critical habitat would be anticipated under the Proposed Action.

4.2.2.1.3 Fish

Giant Manta Ray
Direct Effects: The main threat to both Manta species is fishing, whether targeted or incidental. Other threats, such as mooring line entanglement and boat strikes, can also wound manta rays, decrease fitness, or contribute to non-natural mortality (Deakos et al. 2011). Because manta rays are highly mobile, it is highly unlikely that they would collide with a stationary dredge or other construction-related vessels associated with the implementation of a beach restoration project under the Proposed Action alternative. Therefore, no direct effects to the giant manta ray are anticipated.

Indirect Effects: No indirect effects to the giant manta ray would be anticipated under the Proposed Action alternative.

Cumulative Effects: No cumulative effects to the giant manta ray would be anticipated under the Proposed Action alternative.

4.2.2.1.4 Birds

Band-Rumped Storm-Petrel
The band-rumped storm-petrel is a seabird that spends its non-breeding life at sea. This species prefers to nest in crevices or holes in cliff faces and remote lava flows (KESRP, 2018b). The storm-petrel's greatest threats are similar to other sea and land birds on Hawaiʻi, which include non-native predators such as cats, rodents, and mongoose. Fledglings are vulnerable to disorientation by artificial lighting sources where they may become stunned and fly in circles until they land on the ground making them vulnerable to predators. They have also been documented to ground on cruise ships in Hawaiian waters (ABC, 2015).

Direct Effects: The Proposed Action alternative could potentially influence fledgling disorientation if construction activities are permitted to occur at night with minimal lighting restrictions. However, as a best management practice, lighting associated with the project construction will be minimized to reduce the possibility of disorienting fledgling seabirds making their way to the sea (see Section 5.8). Once the storm petrel is at sea, it is highly unlikely that they would collide with a stationary dredge or other construction-related vessels under the Proposed Action alternative. Therefore, no direct effects to the band-rumped storm-petrel are anticipated.

Indirect Effects: No indirect effects to the band-rumped storm-petrel would be anticipated under the Proposed Action alternative.

Cumulative Effects: No cumulative effects to the band-rumped storm-petrel would be anticipated under the Proposed Action alternative.

Newell's Shearwater
The Newell's Shearwater is a pelagic seabird that nests only in Hawaiʻi, primarily in Kauaʻi. They nest in burrows beneath ferns and tree roots in dense forest and on steep slopes and cliffs

(UWFWS, 1983) and only fly to and from their burrows at night (KESRP, 2018). Current threats to Newell's Shearwaters include artificial lights along the coast that often blind or disorient fledglings making their maiden journey to sea. Once on the ground, they are unable to fly and are often killed by cars, cats, and dogs. Adults can collide with power facilities and utility lines in their flight corridors. Additionally, the loss and degradation of forested habitat caused by introduced plants and herbivores presents a threat (USFWS, 2011).

Direct Effects: Similar to the band-rumped storm petrel, the Proposed Action alternative could potentially influence fledgling disorientation for Newell's Shearwaters if construction activities are permitted to occur at night with minimal lighting restrictions. However, as a best management practice, lighting associated with the project construction will be minimized to reduce the possibility of disorienting fledgling seabirds making their way to the sea (see Section 5.8). Because the Newell's Shearwater is highly mobile and normally spends its time over open tropical seas and offshore waters near its breeding grounds (Birdlife International, 2017), it is highly unlikely that they would collide with a stationary dredge or other construction-related vessels associated with the implementation of a beach restoration project under the Proposed Action alternative and, therefore, no direct effects are anticipated.

Indirect Effects: No indirect effects to the Newell's Shearwater would be anticipated under the Proposed Action alternative.

Cumulative Effects: No cumulative effects to the Newell's Shearwater would be anticipated under the Proposed Action alternative.

4.2.2.1.5 Insects

<u>Yellow-Faced Bee</u>
Direct Effects: Yellow-faced bees depend on a variety of habitats including the coastal strand, dry forest and shrublands, mesic and wet forests, and subalpine shrublands (Xerces Society, 2018). Within these habitats, the majority of species nest in the ground while others nest in the hollow stems of plants. As such, construction activities associated with the Proposed Action alternative (including the use of heavy machinery such as bulldozers and dump trucks) may disrupt yellow-faced bee's nests found along the shoreline resulting in direct effects. In addition, yellow-faced bees nests located in proximity to eroding shorelines that do not receive a beach restoration project may be inundated by high tides or storm surge resulting in direct effects. However, because the streamlined permitting associated with the proposed small-scale beach restoration program may result in an increased number of projects that serve to protect eroding shorelines, some yellow-faced bee nesting habitat may become protected and preserved.

Indirect Effects: Yellow-faced bees are important pollinators to the native plants and trees of Hawaiʻi and both the native vegetation and bees depend on each other for survival. The loss of native vegetation as a result of coastal erosion could lead to indirect effects to yellow-faced bees through loss of habitat. However, the Proposed Action is anticipated to increase the number of beach restoration projects implemented along the state's shoreline. As such, native vegetation may be protected from eroding shorelines and result in the maintenance of this important habitat for yellow-faced bees.

Cumulative Effects: An increased number of small-scale beach restoration projects could lead to beneficial cumulative effects to yellow-faced bee nesting habitat as a result of increased protection to otherwise eroding shorelines. However, bee nesting habitat may also be negatively affected cumulatively as a result of increased usage of heavy machinery during project construction.

4.2.2.1.6 Plants

The USFWS currently lists 424 endangered or threatened plant species under the ESA that are believed or known to occur in Hawaiʻi (USFWS, 2015). In coordination with USFWS, this list was refined to incorporate only those species that may potentially be affected by the proposed project. The identified 12 plant species are provided in Table 17 in Section 3.2.1.6 and are the focus of the effect analysis below.

Direct Effects: The Proposed Action includes beach restoration projects that may directly affect the native Hawaiian plants that utilize the coastal strand habitat. The sand placed in the dune areas could have a negative direct effect on vegetation if placed over existing dune vegetation. However, this effect will be temporary because replanting efforts will include planting the appropriate native vegetation and monitoring the planted vegetation for success.

Construction activities that occur along the landward side of the beach have the potential to affect plants located in the coastal strand. For example, plant species that utilize the dune areas could potentially be affected by mobilization of construction equipment. As the plants described in Section 3.2.1.6 are ESA protected species, avoidance and minimization efforts would be in place to limit the potential direct effects. However, if vegetation at these access points is removed it will be replanted once construction is complete; therefore, the vegetation will be directly affected but the effect will be temporary and minimal.

Indirect Effects: The Proposed Action would result in a wider beach in those areas proposed for beach restoration, which would help to stabilize and protect existent beach and dune vegetation from storm surge and erosion. Furthermore, the addition of sand to the overall system could further enhance dune development and growth of plants that utilize the coastal strand habitat. The construction of beach stabilization structures would enhance the beach, which would thus support a more stable dune habitat.

Cumulative Effects: The implementation of the Proposed Action would enhance the dry beach in the proposed project areas. This may increase the overall sand available to the dune vegetation system in those areas. Construction of beach restoration projects will aim to enhance dune habitat with minimum effects to existing dune vegetation and dune vegetation plans may be implemented to enhance beach restoration projects.

4.2.2.2 Essential Fish Habitat

Direct Effects: All coastal waters in Hawaiʻi are designated as EFH. Specially, there are a number of EFH units found within the proposed project area which includes the nearshore waters and beaches around the Main Hawaiian Islands. These include the bottomfish management unit, precious corals management unit, coral reef ecosystem management unit, crustacean management unit, pelagics management unit, along with a number of designated habitat areas of particular concern (HAPCs). These managed units may incur direct effects with the implementation of beach restoration projects. The main concerns with respect to the construction of these projects include the potential for entrainment of juvenile fish and fish larvae within the dredge, turbidity, sedimentation, and/or burial of nearshore habitat. The effects pertaining to turbidity and sedimentation are discussed in detail above within Section 4.2.1.4. Due to the fact that the SSBR program limits the extent of the equilibrium toe of the fill to the historical extent of the beach and due to the dynamic natural ephemeral flow of sand within the nearshore environment, no direct effects to EFH as a result of this alternative are anticipated.

Entrainment of aquatic organisms occurs from the uptake of sediments and water by the suction field generated at the dredge head (Reine and Clarke, 1998). Organisms are susceptible to suction dredges due to their inability to escape the suction field around the intake pipe (McNair and Banks, 1986). If juvenile fish or other organisms survive uptake by the dredge, they may suffer from additional injuries or mortality from abrasion, entrapment, or asphyxiation within the dredge. Rates of mortality tend to be highly dependent on the type of dredge used and the vulnerability of the organisms entrained. During suction dredging operations, bottom sediments and associated benthos are picked up by the suction head, violently mixed, and deposited as slurry at a new location. Delicate fauna will generally be destroyed in this process (ESL, 1979). However, the direct effects associated with dredge entrainment on essential fish habitat would only occur during active sand recovery operations which would be temporary and short-term.

The potential direct effects to essential fish habitat would be minimized in several ways. First, small-scale beach restoration projects are to be limited to nourishment activities involving the placement of no more than 25,000 cubic yards of beach compatible fill. In addition, this fill placement would not extend beyond a historical shoreline (i.e. areas that were previously covered) and would prevent the smothering or burial of habitat that had not been previously covered with sediment. Taking these factors into account along with the fact that sand found in the nearshore environment is ephemeral in nature and its spatial extent is known to change seasonally and as a result of localized storm events, the potential for significant direct effects to essential fish habitat within the project area will be minimalized. Adherence to the BMPs listed in Sections 5.6 and 5.7, will limit these potential direct effects even further.

Indirect Effects: No indirect effects to essential fish habitat would be anticipated as a result of the Proposed Action alternative.

Cumulative Effects: Potential long-term physical and biological effects could occur if recovery efforts significantly change the physiography of offshore or nearshore borrow areas. Sediment removal from a borrow area has the potential to alter seabed topography, particularly if sediment removal in the borrow area results in a deep hole. Numerical modeling of morphological changes associated with sand mining has been used to show borrow area location can drive whether infilling of an excavated area will occur (CSA International et al., 2009). A borrow area located in an active area will likely be in-filled, while an un-active area may not. In instances where in-filling does not occur, the hydrology and hydrodynamics that drive benthic recolonization and recovery can subsequently be affected. The potential for creation of deeper holes is higher with a suction dredge than a hopper dredge. These cumulative effects would be minimized due to the fact that no single small-scale beach restoration project could utilize more than 25,000 cubic yards of material placed on the beach. This limited volume removed from a marine-based borrow area would therefore limit the cumulative effects associated with a lack of in-filling, as described above.

Adherence to the BMPs listed in Section 5, including proper construction practices, turbidity control measures, use of beach-compatible fill containing less than 2% fines, habitat delineation and monitoring, and other measures will limit the potential effects of beach restoration and construction activities to essential fish habitats.

4.2.2.3 Scleractinian Corals

Direct Effects: This PEA excludes any activities that would cause significant negative, long-term effects to any biological resources, therefore permanent effects (i.e. burial) to scleractinian corals are not anticipated from the Proposed Action. However, there is the potential for an unanticipated accident to occur during the Proposed Action that may result in damage to hardbottom and reef communities. The risk will depend on the distance between hardbottom resources, the borrow areas, and the fill areas. Use of buffers between these areas will help protect the hardbottom resources from unanticipated effects (see Section 5.7). Nonetheless, unanticipated incidents may include dragging of equipment such as anchors, dredge spuds, ropes, or cables across reef resources.

During previous biological monitoring conducted for the 2007 Kūhiō Beach restoration project near Waikīkī, O‘ahu, coral damage was observed on the fossil limestone reef rock that bordered the borrow areas. This project recovered sand from 610 m (2,000 ft) offshore of Kūhiō Beach and placed the sand on to three sites along the beach. The observed damage was likely due to the movement of equipment such as pipeline and anchor lines and was attributed to an acute swell event during recovery operations. The damage to the monitored corals ranged from minor (some branches broken, but colony mostly intact) to severe damage or colonies missing entirely. At one-year post-construction biologists revisited the damaged colonies and did not observe any new coral colony damage. The damaged colonies varied in their recovery, with reports of new growth due to fragmentation, more robust colony growth, overgrowth by turf algae and mortality. In response to the damages incurred by this project, the following measures were recommended for the subsequent 2012 Waikīkī Beach nourishment project: (1) locating and marking significant corals in the vicinity of sand recovery areas; (2) identifying a specific pipeline route corridor which minimizes the potential for damage to coral and other benthic fauna; and, (3) transplanting corals as necessary and where practicable to relocation them from the construction site, particularly along the pipeline (Sea Engineering, Inc., 2010).

Indirect Effects: Construction activities may result in short-term temporary effects to the water quality of the nearshore marine environment in proximity to the restored beaches in Hawai'i (see Section 4.2.1.4). Specifically, increases in turbidity and sedimentation could affect scleractinian corals and the nearshore hardbottom habitat. Turbidity effects to corals include reduced photosynthesis, reduced feeding, reduced growth, and potential increases in mortality. The severity of turbidity-related effects depends upon the sediment grain size distribution, the speed of fill placement, and the degree of nearshore circulation and mixing. Beach fill must meet the requirements in Section 5.6. An increase in turbidity could reduce the opportunity for photosynthesis and interfere with suspension feeders. However, the short duration of the activity would result in only temporary effects due to increased turbidity. Also, sedimentation effects include reduced photosynthesis, reduced recruitment, nutrient stimulation, and potential increases in mortality (SAIC, 2012). The effects of fill placement may be minimized by constructing temporary dikes and/or submerged berms to reduce turbidity and sedimentation.

A recent example of project-related turbidity is the 2012 Waikīkī Beach nourishment project, which was a modified version of the smaller Kūhiō Beach restoration project mentioned above. The Waikīkī Beach nourishment project placed 24,000 cubic yards of recovered sand within the beach fill template. During this project, comparatively higher levels of turbidity were recorded at the nearshore stations at the site of placement relative to the offshore control stations. The increased level of turbidity was observed throughout construction activities and during post-construction monitoring. Specifically, at the start of sand placement activities a turbidity plume that extended several hundred meters offshore was observed and triggered the construction of a sand berm and the installation of a second silt curtain. This increase in turbidity occurred despite proper fill material being used (the borrow area sand had the same grain size distribution, texture, and a similar color of the native beach sand) and following BMPs, such as dewatering and the use of silt containment devices. The increased turbidity was attributed to the release of micritic calcium carbonate, which forms via bioerosion, increased wave action during south swells, and a residual effect of re-suspension of the fine-grained fraction of the material placed on the beach (Marine Research Consultants, Inc., 2010). Biological monitoring conducted for the project used multivariate analyses to compare the benthic communities (i.e. corals, algae, macroinvertebrates, and infauna) located within the effect zone and the control areas. The analyses indicated that there were statistical differences (reduced diversity and increased sand) between the zones, however there was no significant change in coral percent cover or the number of coral colonies (although there were very few corals in the effect zone). The variation between the benthic communities were not attributed to project effects due to the uncertainty of the spatial and temporal scope of these results and the dynamic processes affecting the nearshore environment (DLNR, 2013).

Under natural conditions, corals found in the nearshore environment are often inundated by elevated turbidity and increased rates of sedimentation during high surf and runoff events. They also experience frequent salinity and temperature fluctuations, tidal ranges, and prolonged aerial exposure (Kleypas, 1996). A growing number of field studies have documented that these coral communities often demonstrate high diversity possess a unique adaptive capacity to withstand suboptimal physical conditions (Morgan et al., 2016; Ryan et al., 2016). As such, the resilient nature of nearshore corals in Hawai'i is expected to allow them to endure some levels of project-induced turbidity and sedimentation.

Cumulative Effects: Some projects may result in nearshore hardbottom becoming temporarily covered with sand, which is a naturally occurring process within the nearshore beach environment. Globally, corals are affected by sea level rise, sea surface temperature anomalies, ocean acidification, and associated coral bleaching events. Potential local effects include damage associated with dredge related equipment, sedimentation, and turbidity effects. The limited spatial scale of future projects implemented under the SSBR program bolster the ability of coral reef ecosystems to recover from potential project-related effects. Furthermore, adherence to the BMPs listed in Section 5, including proper construction practices, turbidity control measures, use of beach-compatible fill containing less than 2% fines, a coral/hardbottom monitoring plan, and other measures will limit the potential effects of beach restoration and construction activities to these coral resources.

4.2.2.4 Benthic Infauna

Direct Effects: It is generally accepted that the construction activities associated with the Proposed Action alternative may result in the mortality of the benthic infaunal community due to mechanical damage during recovery operations, entrainment in the dredge pipe, burial at the fill site, and crushing by heavy equipment as the material is shaped and graded on the beach. Often times, state and federal regulatory agencies require multi-year monitoring programs designed to document the recovery of the benthic invertebrates as a permit requirement for beach nourishment projects.

The reported recovery rates of these infaunal communities, as cited from within the literature, vary and are dependent upon the taxa studied. Furthermore, there are a number of factors associated with construction practices that drive these rates. In general, the benthic community is well adapted to disturbance and therefore often recovers rapidly in excavation sites, particularly those located within the inner shelf (Johnson and Nelson, 1985; Jutte et al., 2002; Posey and Alphin, 2002; Day et al., 1971; Pratt, 1973). The resiliency of the invertebrate assemblages in relatively unstable marine subtidal sediments is due primarily to the life histories of these benthic populations (Newell et al., 1998; Posey and Alphin, 2002). Invertebrate larvae of soft sediment subtidal systems have a higher proportion of planktonic forms capable of an extended period of viability compared to those found in intertidal and hardbottom areas (Grantham et al., 2003). This can lead to the potential for the dispersal across large spatial scales. Furthermore, marine organisms may successfully recolonize unoccupied space if that space provides the species the necessary ecological conditions it requires. Because most of these marine infaunal species possess a dispersive planktonic phase of their lifecycle, they are capable of moving great distances and, therefore, there are potential colonists always available in the local and regional species pool to promote recolonization within a borrow area. In addition, recolonization of disturbed borrow areas may also be facilitated from nearby habitats containing mobile species.

A recent study by Wooldridge et al. (2016) offers a useful summary of key peer-reviewed literature on the subject. As cited in Wooldridge et al. (2016), recovery rates were documented to be within one year or less for amphipods (Jones et al., 2008; Leewis et al., 2012; Schlacher et al., 2012), mole crabs (*Emerita* spp.) (Hayden and Dolan, 1974; Leewis et al., 2012; Peterson et al., 2014), bean clams (*Donax* spp.) (Leewis et al., 2012) and polychaetes, most notably the spionid polychaetes *Scolelepis squamata* (Leewis et al., 2012; Manning et al., 2014). Other studies report complete recovery within one year of these and other infaunal taxa such as isopods and other bivalves (Burlas et al., 2001; Peterson et al., 2006, Jones et al., 2008; CZR Incorporated and CSE, Inc., 2013; CZR Incorporated and CSE, Inc., 2014). In a robust assessment of past studies within the primary and grey literature, Wilber et al. (2009) reviewed a large body of monitoring studies, also analyzed previously by Peterson and Bishop (2005). In those studies, focusing on the intertidal macrofauna (benthic organisms, including infaunal species, greater than 1mm) at fill sites, the reported macroinvertebrate recovery rates ranged from less than one month (Gorzelany and Nelson, 1983), through less than one year (Jutte et al., 2002), and to up to 2 years (Rakocinski et al., 1996). Factors contributing to the recovery rates, as cited in these studies, included the seasonality of construction and the similarity of sediments used as fill material to the native beach sediments. Projects incorporating well-matched sediments (with respect to grain size, sorting, carbonate content, and percent fines) and construction periods that avoided the spring recruitment pulse were associated with faster recovery rates. By contrast, springtime construction and a poor sediment match (too coarse, shelly, or fine) led to longer recovery times. A number of recent studies have also reported substantially longer recovery periods, or that no recovery of the infauna was observed through the duration of the monitoring study (Colosio et al., 2007; Manning et al., 2014; Peterson et al., 2014; Wooldridge et al., 2016). However, consideration of the construction practices implemented in the associated beach nourishment projects may help explain the varied results, as well as provide valuable insight for best management practices.

Adherence to the BMPs listed in Section 5, including sediment compatibility, will limit the potential effects of beach restoration and construction activities to these resources. Furthermore, due to the fact that the SSBR program limits the extent of the equilibrium toe of the fill to the historical beach, the dynamic natural ephemeral flow of sand within the nearshore environment, and the resilient nature of benthic infauna, no direct effects to the resource are anticipated

Indirect Effects: An indirect effect of the activities associated with the Proposed Action alternative may include effects on shorebirds that prey on intertidal benthic organisms. In addition, benthic invertebrates that inhabit the borrow areas provide a prey source, and even structural habitat, for demersal fishes (CSA et al., 2009). In general, recovery and filling activities remove the infaunal community that serves as a food resource for these affected organisms. However, these indirect effects may be temporary as demonstrated following the 2007 Kūhiō Beach Restoration project. Monitoring efforts noted that the recovery areas fill back up with sand and the benthic infauna recovered following construction (Sea Engineering, Inc., 2010).

Cumulative Effects: The projects associated with the Proposed Action alternative, in addition to past projects and any future actions within the proposed project areas, may result in direct and indirect effects to benthic infaunal communities. The temporal and spatial scope as well as the frequency of the constructed projects will determine the potential effect to the infauna and epifauna of these habitats. However, as demonstrated by individual projects constructed in the recent past, these effects to benthic infauna communities are short-term and relatively minor in nature. Therefore, cumulative effects are not expected.

4.2.2.5 Marine Algae

Marine algae are a major component of the marine ecosystem in the Hawaiian archipelago as there are approximately 400 species found in this region. The endemic species *Halimeda kanaloana* is of particular ecological importance and will be the focus of the effect analysis.

Direct Effects: Construction activities associated with the Proposed Action alternative that may directly effect *Halimeda kanaloana* include beach maintenance activities (sand pushing, bypassing, and backpassing), beach maintenance activities (recovery, transport, and placement of beach compatible fill), and the construction of beach stabilization structures. Both offshore and nearshore dredging have the potential to effect *Halimeda kanaloana* due to this species preferred habitat of sandy substrates that is found from the intertidal zone down to approximately 100 m (300 ft). Both recovery operations and vessel anchoring may directly effect this species through removal of the upright plant body (thallus) or removal of the entire plant holdfast. Recovery of the plant could range from a few months to many months to a year depending on the damage sustained (Friedlander et al., 2008). The construction of beach stabilization structures may have similar effects depending on the methods used and location of the species in the nearshore habitat. Beach maintenance and beach management activities could potentially directly affect *Halimeda kanaloana* by burial of this species.

Large expanses of this species (i.e. *Halimeda* meadows) occur mainly throughout the Maui Nui island complex, which includes the islands of Molokaʻi, Lānaʻi, Maui, and Kahoʻolawe. Future projects conducted offshore of these islands should make an effort to avoid these areas as they provide an important ecological function. The *Halimeda* meadows can produce up to 800 grams of calcium carbonate per m^2 annually to the Maui Nui island complex as their calcified plant bodies breakdown through their natural life cycle processes (Friedlander et al., 2008).

Indirect Effects: Increased turbidity and sedimentation during construction activities may affect *Halimeda kanaloana* in nearshore areas by smothering the algae or decreasing light availability and potentially affecting the plant's ability to photosynthesize; however, these effects would be short-term and would only temporarily affect this species.

Cumulative Effects: The projects associated with the Proposed Action alternative, in addition to past projects and any future actions within the proposed project areas, may result in direct and indirect effects to *Halimeda kanaloana*. However, these potential effects may be avoided by excluding high density areas of the species and allowing time for the species to recover between events. *Halimeda kanaloana* is a calcareous alga, meaning the plant has plate-like calcified segments (i.e. calcium carbonate) and is vulnerable to ocean acidification like other calcareous organisms such as corals. Sand resource areas containing a high density of *Halimeda* would be avoided as potential borrow area sites due to the fact that they often contain course and friable *Halimeda* plates and fines. As such, no cumulative effects to marine algae are anticipated.

4.2.3 Socio-economic Effects

Direct Effects: The Proposed Action would allow for the permitting of small-scale beach restoration projects through a streamlined approach. As such, applicants for small-scale beach restoration projects would face a less costly and time consuming permitting process relative to the No Action alternative. Table 24 depicts the wide range of costs associated with beach restoration projects constructed on the Main Hawaiian islands (although the majority of the projects identified were on Oahu and Maui). Although the table includes costs per cubic yard of material where possible, the information ascertained by the USACE (2018) did not necessarily distinguish between expenditures on the nourishment portion of projects as compared to other construction activities such as groin installation. As such, the range of costs (\$50- \$400/cy) reflects the aggregation of all project construction expenditures in some cases. Typically, in order to maintain the integrity of a beach restoration project, nourishment is required every 3-10 years, depending on project conditions. As such, nourishment events increase the overall construction costs over the lifespan of any given project.

Table 24. Recent beach nourishment and dune restoration projects (all islands) (Source: DLNR and Maui County, as provided in USACE, 2018).

Beach	Island	Year	Volume (cy)	Cost
Kapaʻa Beach Park	Kauaʻi	2016	600	~$14,000
Kikiaola	Kauaʻi	2014	60,000	Bypass
Poʻipū Beach Park	Kauaʻi	2013	490	$23,000
Poʻipū Beach Park	Kauaʻi	2005	500	N/A
Brennecke Beach	Kauaʻi	2000	1,500	N/A
Poʻipū Beach Park	Kauaʻi	1983	4,000	N/A
Poʻipū Beach Park	Kauaʻi	proposed	6,600	$2-3 million ($303/cy)
Kapaʻa Beach Park	Kauaʻi	proposed	74,000	$7.4 million ($100/cy)
Laulea Cove (North Shore)	Maui	2008-2016	N/A	N/A
Kamaole II Beach Park	Maui	2012	125	$11,925 for sand only
Kalepolepo Beach Park	Maui	2012	125	$11,925 for sand only
Sugar Cove	Maui	1995-2011	29,731	~$50+/cy for sand only (~$1.5 million total)
Stable Road	Maui	2010	3,000	$1.2 million ($400/cy – includes installation of 4 groins)
Halama Street Altman Property	Maui	2009	~200-300	N/A
Spreckelsville, Kahului	Maui	2007	500	N/A
Mama's Fish House, Pāʻia	Maui	2006	500	N/A
Kanai A Nalu	Maui	2003	3,000	N/A
Maui Bay Villas	Maui	proposed	5,000	N/A
Kaʻanapali Beach	Maui	proposed	75,000	$7.6 million ($101/cy)
Kahana Bay	Maui	proposed	50,000 to 100,000	$7-11 million
Iroquois Point	Oʻahu	2013	85,000	$14 million ($147/cy – includes construction of 9 groins)
Waikīkī Beach	Oʻahu	2012	27,000	$2.4 million ($89/cy – includes cost of groin removal)
Kūhiō Beach, Waikīkī	Oʻahu	2007	9,000	$475,000 ($52/cy)
Lanikai Beach	Oʻahu	2000	10,000-12,000	N/A

Indirect Effects: With a streamlined permitting process in place for small-scale beach restoration projects, property owners will be able to address immediate oceanfront erosion issues much more rapidly compared to the current scenario under the existing permitting landscape. With the streamlined process in place, it is anticipated that property owners will be less likely to embark upon the more time consuming and costly permitting process associated with shoreline armoring projects. Therefore, the indirect economic effects associated with managing increased erosion at adjacent properties as a result of the construction of shoreline armoring projects would be less likely to be incurred. Furthermore, the restoration of beaches will allow for the continuation of beach recreation and tourism resulting in additional economic benefits. Because the streamlined permitting approach would result in the expedited issuance of the permits for the construction of small-scale beach restoration projects, projects may be able to be implemented before applicants would be required to obtain easements from the state for existing structures that may become encroaching with further erosion, resulting in an additional economic savings.

Cumulative Effects: The implementation of the Proposed Action would provide beneficial cumulative economic effects due to the fact that some property owners would opt to construct small-scale beach nourishment projects rather than shoreline armoring projects. In doing so, the potential for erosion at adjacent properties caused by shoreline armoring projects may be avoided and adjacent property owners would not face costs associated with planning for and constructing additional erosion control projects. In addition, the cumulative effect of restoring Hawaii's beaches will result in the maintenance of its tourism-based economy.

4.2.4 Cultural Effects

Direct Effects: The Proposed Action alternative would involve the recovery of uncontaminated sediment with the use of construction vehicles, including but not limited to trucks and other construction equipment. The vehicles and construction activities generally have the potential to adversely affect cultural resources, particularly subsurface cultural resources like historic burial sites. Recommended best management practices, as detailed in Section 5.3, are provided to be included as conditions to all authorized activities to minimize any potential direct effects to historical and cultural resources.

Indirect Effects: Historic and cultural resources may also be indirectly affected as these resources may be affected or otherwise disturbed within a recovery area or fill site. Therefore, it is critical to ensure that best management practices are also applied to recovery areas and fill sites as well and that these sites are considered part of the project area and identified area of potential effect. No areas with known historic sites or cultural resources should be allowed to be used as a borrow area without prior consultation and approval from the State Historic Preservation Division.

Cumulative Effects: The cumulative effect of the Proposed Action alternative may be beneficial if implemented with all the proper best management practices in place and within regular consultation with the State Historic Preservation Division. As stated in Section 4.1, coastal erosion adversely affects historic sites and cultural resources and the Proposed Action potentially reverses this trend of ongoing adverse effects.

4.2.5 Effects on Natural Hazards

Direct Effects: The Proposed Action alternative may be directly affected by natural hazards such as tsunamis and coastal erosion. Small-scale beach restoration activities would serve to provide some level of protection to homes and infrastructure from the effects of these natural hazards. However, the level of protection would be a factor of the size of the tsunami and the rate of coastal erosion as well as the location of the beach restoration project. In general, beach restoration projects will extend the shoreline seaward, increasing the space between the water and the existing homes and infrastructure. This will increase the natural oceanfront erosion buffer, the wave energy dissipating properties of the beach, and decrease tsunami- and wave-induced run-up and flooding of the backshore area.

Indirect Effects: No indirect effects as a result of tsunamis and chronic erosion to the Proposed Action alternative would be expected.

Cumulative Effects: Some shoreline areas that receive small-scale beach restoration projects would withstand the effects of natural hazards such as tsunamis and chronic erosion. Cumulatively, this would result in an increased area of preserved beaches and intact homes and infrastructure. See Section 1.1.3 for additional details.

4.2.6 Effects on Recreational and Aesthetic Resources

Direct Effects: Under the Proposed Action, it is anticipated that more property owners facing erosion issues would opt to construct beach restoration projects rather than shoreline armoring projects due to the resultant streamlined permitting process for small-scale beach restoration projects. The restoration of beaches would result in wider and larger beaches thereby allowing for direct positive effects to beach related recreational opportunities such as sunbathing, swimming, and other activities detailed in Section 3.6. These larger beaches would inherently also improve the aesthetics of the coastal environment. During the active construction of beach restoration projects, beach access may be temporarily limited due to the presence of heavy machinery and the aesthetics of the beach environment would be temporarily negatively directly affected.

Indirect Effects: When beach restoration projects are constructed, recreational opportunities may increase due to indirect effects. The use of nearshore waters (swimming, diving, and surfing) in proximity to beach restoration projects may increase due to improved water quality associated with the implementation of beach restoration projects in areas where the existing shoreline was eroding, thus mitigating the release of soils into the nearshore waters and exposure of on-site sewage disposal systems. This improved nearshore water quality resulting from beach restoration projects would also indirectly improve the aesthetics.

Cumulative Effects: The construction of beach restoration projects in response to coastal erosion issues would result in cumulative beneficial effects to recreational and aesthetic resources. Specifically, the proposed activities are not anticipated to affect the quality of waves and thereby surfing, a culturally important recreational activity, would not be cumulatively affected by the Proposed Action.

5 BEST MANAGEMENT PRACTICES

A wide range of Best Management Practices (BMPs) will be employed to avoid any project-related impacts and minimize negative effects to the various resources found within the proposed project areas. These BMPs are discussed below. Additional site-specific conditions may be imposed based on the permit category and information provided during the application process. Site-specific conditions will be determined by the OCCL and through coordination with cooperating resource agencies when determining appropriate mitigation measures.

5.1 General Construction Practices

The following measures will be employed to avoid impacts and minimize negative effects caused by general construction activities:

1. The construction contractor should perform daily inspections of equipment for conditions that could cause spills or leaks; clean equipment prior to operation near the water; determine appropriate refueling and servicing sites; implement adequate spill response procedures; develop stormy weather preparation plans; and implement adequate turbidity control measures.

2. In the event of any petroleum spill on the beach or in the water, the operator must take immediate steps to contain and remove the contaminant.

3. Projects must abide by all applicable regulations concerning environmental pollution control.

4. In order to avoid impacts and minimize negative effects associated with the transport of material to the fill site, the applicant should negotiate with the dredging contractor to monitor and assess the pipeline or any other dredge fill conveyance system used during construction. This will serve to avoid leaking of sediment from the pipeline couplings or other equipment, or other leaks that may result in sediment plumes, siltation, and/or elevated turbidity levels. The applicant must coordinate with the dredgers and have in place a mechanism to cease dredge and fill activities in the event that a substantial leak is detected (leaks resulting in turbidity that exceed state water quality standards or sedimentation). Operations may resume upon appropriate repair of affected couplings or other equipment.

5. Any construction related debris that may pose an entanglement hazard to marine protected species must be removed from the project site if not actively being used and/or at the conclusion of the construction work.

6. Beach sand should not be removed from the littoral cell (either above or below mean high water) during construction activity.

7. All areas to be excavated should be surveyed and "ground-truthed" as necessary to identify any potential features of concern such as reef, rock, fisheries habitat, cultural resources,

infrastructure, or debris. Land-based methods may include hand-held magnetometer and probing surveys, while marine-based methods may include fathometer, magnetometer, side-scan sonar, and probing surveys. The survey method, layout, and data collection frequency should be sufficient to clear the excavation area of any features that would affect future excavations.

8. The project area (i.e. both fill area and borrow area) should be surveyed before and after construction. The survey method, layout, and data collection frequency should be sufficient to adequately map topographic, bathymetric, and constructed features.

9. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.2 Public Safety

The following measures will be employed to avoid impacts and minimize negative effects to public safety:

1. Public access along the shoreline during construction should be maintained so far as practicable and within the limitations necessary to ensure safety.

2. Project area should be cordoned off and marked with posted signs during construction.

3. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.3 Cultural Resources

The following measures will be employed to avoid impacts and minimize negative effects to cultural resources:

1. No activity will be authorized in or immediately adjacent to properties listed or eligible for listing in the National Register of Historic Places without the written consent of the SHPD.

2. Contractors must use best practices to not negatively affect or destroy any existing surface historic or cultural sites which may be near or within a project area. A minimum protective buffer of 10 feet should be maintained around surface sites, where no construction operations will be allowed, including storing or stock piling of materials or vehicular traffic. If these practices are not deemed feasible or are overly burdensome, then the SHPD should be notified to determine proper treatment and mitigation, which may include an archeological assessment.

3. If proposed activities include the repair and/or removal of potentially-historic infrastructure such as seawalls, any historic infrastructure would need to be evaluated for National Register eligibility. If deemed to have integrity and significance, in coordination with the SHPD, repairs and replacement of the historic infrastructure should be completed using Secretary of the Interiors Standards for Historic Replacement.

4. Should proposed activities include excavations, any excavations must proceed under approved applicable plans and permits. In the event that, during the course of the project, it becomes necessary for land-based excavation to extend beyond the historic extent of beach erosion and/or substantial excavation becomes warranted for unplanned activities, such as the creation of dewatering basins due to loss of subaerial beach, then the SHPD should be notified to determine proper mitigation procedures, which may include archaeological monitoring.

5. Contractors must use best practices to not negatively affect or destroy any existing submerged historic or cultural sites which may be near or within a project area. A minimum protective buffer of 500 feet should be maintained around submerged sites, where no beach fill recovery operations will be allowed. If these practices are not deemed feasible or are overly burdensome, then the SHPD should be notified to determine proper treatment and mitigation, which may include an archeological assessment.

6. Permit holders should suspend all work if historic properties, including sub-surface cultural deposits and burials, are uncovered during a project and proceed in coordination with the SHPD. The DLNR will also direct a permit holder to suspend all work if the DLNR is notified by the public or another agency that historic properties or burials are being adversely affected by the project. If historic properties or burials are being affected, work must be suspended or modified to the extent necessary to mitigate any adverse effects. If human remains are discovered, the permit holder must contact the SHPD immediately.

7. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.4 Air Quality

The following measures will be employed to avoid impacts and minimize negative effects to air quality:

1. Dust should be prevented from becoming airborne at all times including non-working hours, weekends, and holidays. Typical dust-preventing measures include sprinkling.

2. Construction vehicles should use emission control devices.

3. Beach nourishment activities using hydraulic dredges should employ direct fill placement procedures when possible to avoid excessive emissions created when mechanically transporting dewatered fill.

4. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.5 Noise

The following measures will be employed to avoid impacts and minimize negative effects to noise:

1. Noise should be kept within acceptable levels at all times in conformance with HAR Title 11 § 46 Community Noise Control, State Department of Health, Public Health Regulations. Construction equipment should be equipped with suitable mufflers to maintain noise within levels complying with applicable regulations. Starting of construction equipment meeting allowable noise limits should not be done prior to 7:00 a.m. without prior approval. Equipment exceeding allowable noise limits should not be started prior to 7:30 a.m.

2. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.6 Water Quality

The following measures will be employed to avoid impacts and minimize negative effects to water quality:

1. Only beach compatible fill should be placed on the beach or in any associated dune system. Beach compatible fill should maintain the general character and functionality of the beach and the adjacent dune and coastal system. Beach fill should be similar in composition, grain size distribution (sand grain frequency, mean and median grain size, and sorting coefficient), color, and texture, and should not contain:

   - Greater than two percent (2%), by weight, silt, clay, or colloids passing the #230 sieve (4.0φ);

   - Greater than fifty percent (50%), by weight, very fine sand passing the #120 sieve (3.0φ);

   - Greater than ten percent (10%), by weight, fine gravel retained on the #4 sieve (-2.25φ);

   - Coarse gravel, cobbles, or material retained on the ¾ inch sieve (-4.25φ) in a percentage or size greater than that found on the native or existing beach;

   - Construction debris, toxic material, or other foreign matter; and,

   - Material that results in cementation of the beach.

   If the native or existing beach exceeds any of the limiting parameters listed above, then the beach fill should not exceed the measured level for that parameter. More restrictive values for the sediment parameters may be considered on a project specific basis to ensure that the placed beach fill is similar in composition, grain size distribution, color, and texture to the sediment in the coastal system at the placement site. Beach fill that falls outside of these limits should be considered unacceptable and may be subject to remediation.

2. Drainage outlets at the shoreline should be maintained to minimize erosion and pollution of waterways during construction. Surface runoff should be controlled to minimize silt and other contaminants entering the water. Should excessive siltation or turbidity result

from the contractor's method of operation, the contractor must implement turbidity control measures as necessary to correct the problem.

3. Visual monitoring should be conducted during construction and include ongoing inspections for turbidity outside the project area, which is to be identified in the project permit application. In the event that excessive turbidity is observed outside the project area, work should be suspended or modified to the extent necessary to mitigate any adverse effects.

4. The applicant should demonstrate that the beach fill was obtained from an approved source and has been reviewed and authorized by the appropriate authority including but not limited to the SHPD.

5. All placed beach fill should be free of contaminants of any kind including: excessive silt, sludge, anoxic or decaying organic matter, turbidity, temperature or abnormal water chemistry, clay, dirt, organic material, oil, floating debris, grease or foam or any other pollutant that would produce an undesirable condition to the beach or water quality. Should the OCCL determine the beach fill quality inferior, the applicant may be asked to provide better quality fill or screen the existing fill for contaminants at their own expense.

6. For all Permit Categories except IA, geotechnical investigations that provide adequate data to define the character of the native or existing (if native sand is not available) and fill sediments should be conducted. An analysis of the native or existing beach sediment and the sediment within the proposed fill source must demonstrate compatibility. Beach fill compatibility should be determined as follows:

    - Grain size distributions of proposed and constructed projects should be analyzed by a standard laboratory wet sieve technique (ASTM D-1140-92) and tested at a qualified facility. Grain size distributions of proposed projects should include an analysis of fill source (i.e. borrow area) and native beach, when available, or existing beach (i.e. if the beach has been previously nourished) to define beach fill compatibility specifications. Grain size distributions of constructed projects should include an analysis of placed beach fill to document as-built conditions and confirm placed beach fill complies with compatibility specifications. The survey method, layout, and sampling distribution should be sufficient to adequately describe and map the character of the existing beach, fill source, and restored/nourished beach sediments.

        - Nearshore borrow areas and offshore borrow areas with a shallow cut depth may be characterized using surface grab samples and jet probes, while offshore borrow areas with a deep cut depth should be characterized using an appropriate sub-bottom profiler and rigid vibracores. Sub-bottom profile surveys may be necessary for nearshore borrow areas and offshore borrow areas with a shallow cut depth that are located near headlands, hardground areas, or bottom structures. The survey method, layout, and sampling distribution should be sufficient to adequately map the character of the sediment within the borrow area and design the borrow area cuts so the beach fill meets compatibility specifications.

- Fill area sediment samples of the existing (i.e. pre-construction) and restored/nourished (i.e. post-construction) beach should be spaced uniformly alongshore, though tighter spaced samples may be necessary to appropriately characterize smaller stretches of beach or beaches that are cellularized by natural or man-made features. The existing beach composite sediment samples should be surface grab samples collected along the active profile at the following cross-shore morphodynamic zones when present: dry beach (i.e. berm crest – 1 foot below surface), beach face (i.e. swash zone), and beach toe (i.e. base of foreshore near the low tide level). The restored/nourished beach sediment samples should be surface grab samples collected along the constructed beach (i.e. berm crest – 1 foot below surface). The survey method, layout, and sampling distribution should be sufficient to adequately map the character of the sediment within the fill area to appropriately define beach fill compatibility specifications and verify compliance.

▪ All samples should be evaluated visually for color, composition, and texture and sieved in accordance with the applicable sections of ASTM D422-63 (Standard Test Method for Particle-Size Analysis of Soils), ASTM D1140-54 (Standard Test Method for Amount of Material in Soils Finer than No. 230 Sieve), and ASTM D2487-17 (Classification of Soils for Engineering Purposes). The samples should be sieved using the following U.S. Standard Sieve Numbers: 3/4", 5/8", 7/16", 5/16", 3.5, 4, 5, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, 200, and 230. The range of sieve openings must span the range of sediment sizes to be sieved. All sediment statistics should be calculated using the moment method as detailed in Folk (1974).

▪ Beach fill compatibility specifications should take into account the variability of the sediment on the native or existing beach. Compatibility may be demonstrated when the grain size distribution of the proposed beach fill is within twenty percent (20%) of the native or existing beach sediment, as measured by a percent finer than or coarser than value. For example, if 45% of the existing beach sediment is finer than the #100 sieve, the proposed beach fill could contain between 25% and 65% sediment finer than the #120 sieve.

7. For all Permit Categories except IA, an appropriate sediment quality assurance/quality control (QA/QC) plan should be prepared to ensure beach fill placed meets compatibility specifications. This plan should outline the responsibilities of each stakeholder in the project as they relate to the placement of beach fill. The plan should specify the minimum construction oversight, inspection, and reporting requirements to be undertaken to observe, sample, and test the placed fill to verify that it meets compliance specifications. The plan should describe the methods and means to monitor and control the quality and characteristics of the fill material.

8. For all Permit Categories except IA, an appropriate turbidity control plan, which includes turbidity control measures and monitoring methods, should be prepared to ensure turbidity is controlled and limited during construction. This plan should outline the responsibilities of each stakeholder in the project as they relate to the control of turbidity within and outside the project area. The plan should specify the minimum construction oversight, inspection, and reporting requirements to be undertaken to observe, sample, and test turbidity to verify turbidity remains within acceptable limits. The plan should describe the methods and means to monitor and control turbidity.

9. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.7 Essential Fish Habitat

The following measures will be employed to avoid impacts and minimize negative effects to essential fish habitat:

1. For all Permit Categories, except IA, the spatial extent of marine, benthic, and terrestrial habitat types within the project area should be delineated utilizing high-resolution aerial photography, existing data, and/or habitat maps provided by NOAA or others.

2. The design of the beach fill placement and recovery areas should be governed by sediment characteristics, appropriate buffers around any significant biological or cultural resources, and the avoidance of any unmitigated effects to coastal processes or recreational resources.

3. The equilibrium toe of the restored beach should remain within the historical extent of the beach.

4. All dredging in recovery areas should be designed to ensure that dredging will not occur within a pre-determined buffer to protect any significant hardground areas or bottom structures.

5. For projects that include dredging, a navigation and positioning system should be used by the contractor to track the dredge location in relation to a predetermined recovery area considering reef, hardbottom, and/or cultural resources and any designated buffer protection zones. The dredge contractor should be required to track and log dredge and anchor locations whenever dredging is conducted. Dredging must not occur and anchors must not be placed within any designated buffer protection zone.

6. Contractors must use best practices to not negatively affect or destroy any existing essential fish habitat which may be near or within a project area.

7. For all Permit Categories except IA, an appropriate construction quality assurance/quality control (QA/QC) plan should be prepared to ensure the project template is constructed as designed to minimize negative effects to essential fish habitat. This plan should outline the responsibilities of each stakeholder in the project as they relate to the control of beach fill recovery and placement. The plan should specify the minimum construction oversight,

inspection, surveying, analysis, and reporting requirements to be undertaken to verify the project is constructed per design and permit specifications. The plan should describe the methods and means to monitor and control project construction.

8. For Permit Category III, an appropriate project performance monitoring plan should be prepared to monitor, analyze, and document shoreline and volume changes within and adjacent to the project area. This plan should outline the responsibilities of each stakeholder in the project as they relate to monitoring project performance. The plan should specify the minimum post-construction monitoring, surveying, analysis, and reporting requirements to be undertaken to evaluate project performance. The plan should describe the methods and means to monitor beach fill placed and document its transport.

9. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

5.8 Threatened and Endangered Species

The following measures will be employed to avoid impacts and minimize negative effects to threatened and endangered species:

1. A competent observer should be designated to survey the marine areas adjacent to the proposed action for ESA-listed marine species, including but not limited to the green sea turtle, hawksbill sea turtle, and Hawaiian monk seal.

2. Visual surveys for ESA-listed marine species should be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour, to ensure that no protected species are in the area (typically within 50 yards of the proposed work).

3. Upon sighting of a monk seal or turtle within the safety zone during project activity, activity should be immediately halted until the animal has left the zone.

4. No construction should occur at night to reduce the possibility of disrupting and disorienting nesting and hatching sea turtles and fledgling seabirds.

5. Predator-proof trash receptacles should be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles.

6. Escarpment formation and sand compaction should be monitored and beach maintenance (e.g. grading, tilling) should be conducted if needed to reduce the likelihood of affecting nesting and hatchling sea turtles.

7. If a hopper dredge is used, special conditions should be developed to ensure proper monitoring of dredging equipment to prevent any effects to sea turtles or other protected species.

8. Contractors must use best practices to not harm or take threatened and endangered species.

9. Other measures as agreed to in the proposed Interagency Programmatic Agreement.

6 FINDINGS SUPPORTING THE ANTICIPATED DETERMINATION

6.1 Determination Criteria

Hawaiʻi Revised Statutes (HRS) Chapter 343 and Hawaiʻi Administrative Rules (HAR) §11-200 establish certain categories of action that require the agency processing an applicant's request for approval to prepare an environmental assessment. HAR §11-200-11.2 establishes procedures for determining if an environmental assessment (EA) is sufficient or if an environmental impact statement (EIS) should be prepared for actions that may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making such a determination.

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

Management, maintenance, and restoration of the existing beach resource will contribute to the preservation and continuation of this very valuable natural resource. The purpose of implementing the Proposed Action is to enhance natural resources (beaches) and provide beachfront property owners and government entities with a cost effective and time sensitive alternative to coastal armoring. No project will include the restoration of a beach shoreline beyond the historical extent. A wide range of BMPs will be implemented to reduce the potential for the destruction of natural and cultural resources. This proposed PEA provides a thorough overview of the potential for loss or damage of natural and/or cultural resources and concludes that due to its scope (small-scale, use of native sediment, and mitigation measures) there is no potential for an irrevocable commitment to loss or destruction of any natural or cultural resource.

2. Curtails the range of beneficial uses of the environment.

Small-scale beach restoration projects will enhance the beneficial use of the environment by replacing sections of lost beaches and providing enhanced opportunities for recreation (beach use and access to the sea), cultural expression, and ecological processes. Restoration of beaches will serve to provide an increase of habitat extent for a range of biological resources including nesting sea turtles and resting monk seals. Furthermore, the restoration of eroding shorelines will serve to reduce erosion-induced nearshore turbidity. No adverse long-term impacts to the environment are anticipated to result from this project. There may be temporary short-term effects during construction, however, these are not anticipated to be significant. Any effects incurred will be mitigated to the maximum extent practicable by the use of BMPs and monitoring procedures.

3. Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed project is consistent with Hawaii's State Environmental Policy as established in Chapter 343(4)(A), HRS, to establish, preserve, and maintain recreation areas, including the shoreline, for public recreational use.

4. Substantially affects the economic or social welfare of the community or State.

Beaches have been called the backbone or engine of the State's economy. Beaches are essential for our livelihood and to maintain a competitive edge over other visitor destinations. Beaches are an inextricable part of Hawaii's history and culture. Small-scale beach restoration activities will, therefore, improve and contribute to the economic and social welfare of the community and State.

5. Substantially affects public health.

The Proposed Action will have some effect on air, noise, and water quality during construction, however, these will be mitigated to the maximum extent practicable by BMPs and monitoring procedures. The project will not result in any post-construction or long-term effects on public health.

6. Involves substantial secondary impacts, such as population changes or effects on public facilities.

Small-scale beach restoration projects will not affect population but could serve to protect public facilities from erosion damages.

7. Involves a substantial degradation of environmental quality.

Other than temporary, short-term environmental effects during construction, which are generally not considered significant, the proposed project would not result in effects which can be expected to degrade the environmental quality. In fact, the opposite would be true – the projects would restore and maintain a valuable coastal resource for a wide range of biological resources.

8. Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.

Small-scale beach restoration projects will serve to restore and maintain existing beach resources and not expand their extent beyond their historical position. It is possible that several small-scale beach restoration projects could be constructed within the same area and at the same time could result in cumulative effects. However, the cumulative volume of these small-scale beach restoration projects would be limited to 25,000 cubic yards of fill and therefore any cumulative effects would be minimal. The DLNR will discourage multiple projects being proposed in a single littoral cell if the total amount of fill exceeds 25,000 cubic yards.

9. Substantially affects a rare, threatened, or endangered species, or its habitat.

Threatened and endangered species and their habitat are found within the potential project areas associated with the Proposed Action. Each application for small-scale beach restoration, except Category IA, should include a description of the marine biological communities in the immediate project areas. All projects will follow best management practices and pre-determined terms and conditions to avoid any affects to threatened and endangered species and their habitat.

10. Detrimentally affects air or water quality or ambient noise levels.

There will be some temporary, short-term effects to air and water quality and noise levels during construction of small-scale beach restoration projects. However, these effects will be limited to the construction period and will not be significant. BMP's, turbidity controls, and monitoring programs will be in effect to help minimize construction effects. Once construction is complete and the compatible fill is placed on the beach there would be no activity or mechanism for further air, water, or noise effects.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

In many cases, the proposed small-scale beach restoration projects will provide beneficial effects by extending the shoreline seaward, increasing the space between the water and the backshore infrastructure. This will increase the wave energy dissipating properties of the beach, decrease wave run-up and flooding of the backshore area, and thus reduce susceptibility to natural ocean hazards providing substantial benefits to landward development and facilities. These proposed projects will often increase the shoreline elevation and therefore may reduce the existing tsunami flood hazard risk.

12. Substantially affects scenic vista and view planes identified in county or state plans or studies.

Small-scale beach restoration projects are not expected to negatively affect view planes or scenic vistas. In fact, the implementation of these projects may improve these resources by providing sandy areas for viewing coastal resources.

13. Requires substantial energy consumption.

Other than energy expended during construction operations, the project would require no additional energy consumption.

6.2 Anticipated Determinations

Although some minor, short-term effects are expected to occur from the operations associated with the Proposed Action, overall, small-scale beach restoration is expected to enhance beach resources by reducing the demand for coastal armoring (which will accelerate beach loss), and increasing the sand volume within degraded beach cells.

In accordance with the potential effects outlined in Section 4 of this PEA, the provisions of Chapter 343, HRS, and the significance criteria discussed above, the Office of Conservation and Coastal Lands of the State of Hawaiʻi Department of Land and Natural Resources expects the determination for this program to be a Finding of No Significant Impact (FONSI).

7 ENVIRONMENTAL REGULATIONS AND PERMITS

7.1 Environmental Regulations

7.1.1 Clean Water Act

Section 301(a) of the Clean Water Act prohibits the discharge of pollutants into "navigable waters" except in compliance with Sections 402, 404, and certain other provisions. Navigable waters are defined in Section 502(7) as "waters of the United States, including the territorial seas." "Waters of the United States" are in turn defined as regulation to include wetlands which are adjacent to water bodies which are themselves waters of the United States (e.g. wetlands adjacent to tidal waters, wetlands adjacent to traditionally navigable waters, wetlands adjacent to tributaries of those waters, etc.) and isolated wetlands whose use, destruction, or degradation could affect interstate commerce (40 CFR §230.3(s)). The term "wetlands" is defined by regulation to mean "those areas which are inundated or saturated at a sufficiency and duration to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions" (40 CFR §230.3(t)).

In addition to the prohibition of Section 301(a), other Clean Water Act requirements application to "navigable waters," like the development of water quality standards under Section 303, water quality management planning under Sections 208 and 303(e), enforcement under Section 309, etc., also apply to those wetlands which are "waters of the United States." Section 101(a) of the Clean Water Act defined the national goal of restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. Section 303(a)(4) of the Clean Water Act explicitly refers to satisfaction of the antidegradation requirements of 40 CFR 131.21 prior to taking various actions which would lower water quality. The Environmental Protection Agency (EPA) Region 9 antidegradation guidance specifies: "The first step in any antidegradation analysis is to determine whether or not the proposed action will lower water quality… If the action will not lower water quality, no further analysis is needed and EPA considers 40 CFR 131.12 to be satisfied."

<u>Section 401</u>
The purpose of § 401 of the Clean Water Act (CWA) is for states to use its process to ensure that no federal license or permit authorizes an activity that would violate the state's water quality standards or become a future source of pollution. A § 401 Water Quality Certification (WQC) covers construction, operation, maintenance, and decommissioning of a proposed project, and conditions of the WQC become conditions of the federal license or permit.

<u>Section 404</u>
CWA Section 404 establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. The U.S. Army Corps of Engineers (USACE) and EPA share responsibility for administering and enforcing Section 404. The USACE administers the day-to-day program, including individual permit decisions and jurisdictional determinations; develops policy and guidance; and enforces Section 404 provisions. The EPA develops and interprets environmental criteria used in evaluating permit applications, identifies activities that are exempt from permitting, reviews/comments on individual permit applications, enforces Section 404 provisions, and has authority to veto USACE permit decisions.

Section 404 requires a DA permit, issued by the USACE on behalf of the Office of the Secretary of the Army, prior to the discharge of dredged or fill material into any waters of the United States, including wetlands. Discharges of fill material generally include, but are not limited to: placement of fill necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection or reclamation devices such as riprap, groins, sea walls, breakwaters, and revetments; beach nourishment; levees; fill for intake and outfall pipes and subaqueous utility lines; fill associated with the creation of ponds; and other work involving the discharge of dredged or fill material. A DA permit is required irrespective of whether the work is permanent or temporary.

7.1.2 Endangered Species Act

The Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531-1544, 87 Stat. 884, as amended) requires the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to identify plant and animal species that are threatened or endangered since "…various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation; other species of fish, wildlife, and plants have been so depleted in numbers that they are in danger of or threatened with extinction; these species of fish, wildlife, and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people; the United States has pledged itself as a sovereign state in the international community to conserve to the extent practicable the various species of fish or wildlife and plants facing extinction…" Federal agencies are required to assess the effect of any project on threatened and endangered species under Section 7 of the ESA.

Section 7 of the ESA requires federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the existence of any species listed under the ESA, or destroy or adversely modify designated critical habitat of any listed species. Thus, Section 7 requires consultation by the federal 'action agency' (the agency authorizing, funding, or carrying out the action) with the appropriate regulatory agency, either the NMFS for marine species or the USFWS for terrestrial and freshwater species.

Existing threatened and endangered biota found in proximity to Hawaii's beaches (potential project sites) and the potential effects of the proposed Small Scale Beach Restoration Projects are discussed in Section 3.2.1 and Section 4.2.2.1 of this PEA.

7.1.3 Rivers and Harbors Act

The Rivers and Harbors Act address projects and activities in navigable waters and harbor and river improvements. Several of these Acts provided a number of regulatory authorities, the implementation of which has evolved over time. This profile addresses only those sections that relate to the USACE Regulatory program.

The activities identified and authorized under the Proposed Action and program are likely to trigger the need for authorization by the USACE Honolulu District, which is responsible for overseeing and permitting certain activities regulated under Section 10 of the Rivers and Harbors Act of 1899 (Section 10). Structures or work in, above, or beneath navigable waters of the United States require a Department of the Army (DA) permit under Section 10 prior to the commencement of work. The law applies to any dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking.

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The Secretary's approval authority has since been delegated to the Chief of Engineers.

7.1.4 Migratory Bird Treaty Act (MBTA) of 1918, as amended

The Migratory Bird Treaty Act (16 U.S.C. 703-712) protects many species of migratory birds. Specifically, the act prohibits the pursuit, hunting, taking, capture, possession, or killing of such species or their nests and eggs. An activity will be determined to have a significant adverse effect when it is found within a reasonable period of time to diminish the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem.

7.1.5 Fish and Wildlife Coordination Act (FWCA) of 1934, as amended

The purpose of the Fish and Wildlife Coordination Act is to recognize the contribution of wildlife resources to the Nation, the increasing public interest and significance thereof due to expansion of our national economy and other factors, and to provide that wildlife conservation receives equal consideration and be coordinated with other features of water-resources development programs (16 U.S.C. 661). The terms "wildlife" and "wildlife resources," as used in this Act, "include birds, fishes, mammals and all other classes of wild animals and all types of aquatic and land vegetation upon which wildlife is dependent" (16 U.S.C. 666(b)). The Secretary of the Interior, through the USFWS, is authorized to assist and cooperate with federal, state, and public or private agencies and organizations in the conservation and rehabilitation of wildlife. The NMFS provides similar assistance and cooperation for wildlife species under the management responsibilities of the Department of Commerce. 16 U.S.C. 662(a) provides that whenever the waters of any stream or other body of water are proposed to be impounded, diverted, the channel deepened or otherwise controlled or modified, the USACE shall consult with the USFWS, the NMFS as appropriate, and the agency administering the wildlife resources of the state. The consultation shall consider conservation of wildlife resources with the view of preventing loss of and damages to such resources as well as providing for development and improvement in connection with such water resources development.

7.1.6 Federal Coastal Zone Management Act

The Federal Coastal Zone Management Act of 1972 (as amended 16 U.S.C. 1451, et seq.,) excludes federal lands from the coastal zone. However, federal agencies that conduct activities directly affecting the zone must ensure that the activity is consistent with the State's Coastal Zone Management Program. The Hawai'i Coastal Zone Management Program (HRS Chapter 205A), which is administered by the Department of Business, Economic Development and Tourism, Office of Planning, regulates public and private uses in the coastal zone. The objectives and policies of the program consist of providing recreational resources; protecting historic and scenic resources and the coastal ecosystem; providing economic uses; reducing coastal hazards; and managing development in the coastal zone. The Hawai'i Coastal Zone Management Program designates special management areas in the coastal zone, which are subject to special controls on development. These areas extend inland from the shoreline and are established by the county.

7.1.7 National Historic Preservation Act

The National Historic Preservation Act establishes preservation as a national policy and directs the federal government to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. Preservation is defined as the protection, rehabilitation, restoration, and reconstruction of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, or engineering. The Act authorizes the Secretary of the Interior to expand and maintain a national register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology and culture, referred to as the National Register.

Federal agencies having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking shall take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Federal agencies shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on each undertaking (Section 106 (16 U.S.C. 470f). In addition, federal agencies shall assume responsibility for the preservation of historic properties that are owned or controlled by the agencies. They also shall establish a program to locate, inventory, and nominate all properties under the agency's ownership or control that are eligible for inclusion on the National Register (Section 110(16 U.S.C. 470h-2)).

Cultural resources include prehistoric and historic artifacts, archaeological sites (including sub-surface and underwater sites), historic buildings and structures, and traditional resources (such as Native American and Native Hawaiian religious sites). Cultural resources of particular concern include properties listed in or eligible for inclusion in the National Register of Historic Places (National Register). Section 106 of the National Historic Preservation Act (16 U.S.C. 470 et seq.) requires federal agencies to take into consideration the effects of their actions on significant cultural properties. Implementing regulations (36 CFR 800) specify a process of consultation to assist in satisfying this requirement. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register. The term "eligible for inclusion in the National Register" includes all properties that meet the National Register listing criteria specified in

Department of Interior regulations at 36 CFR 60.4. Resources not formally evaluated may also be considered potentially eligible and, as such, are afforded the same regulatory consideration as listed properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as historic properties.

7.1.8 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) (16 U.S.C. 1801-1882, April 13, 1976, as amended) requires that federal agencies consult with NMFS on activities that could harm Essential Fish Habitat (EFH) areas. EFH refers to "those waters and substrate (sediment, hard bottom) necessary to fish for spawning, breeding, feeding or growth to maturity."

In 1996, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) was reauthorized and amended by the Sustainable Fisheries Act (Public Law 104-267). The reauthorized MSA mandated numerous changes to the existing legislation designed to prevent overfishing, rebuild depleted fish stocks, minimize bycatch, enhance research, improve monitoring, and protect fish habitat. One of the most significant mandates in the MSA that came out of the reauthorization was the Essential Fish Habitat (EFH) provision, which provides the means to conserve fish habitat.

The EFH mandate requires that the regional Fishery Management Councils, through federal fishery management plans, describe and identify EFH for each federally managed species; minimize, to the extent practicable, adverse effects on such habitat caused by fishing; and identify other actions to encourage the conservation and enhancement of such habitats. Congress defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 United States Code (U.S.C.) §1802(10). The term "fish" is defined in the MSA as "finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds." The regulations for implementing EFH clarify that "waters" include all aquatic areas and their biological, chemical, and physical properties, while "substrate" includes the associated biological communities that make these areas suitable fish habitats (50 C.F.R. §600.10). Habitats used at any time during a species' life cycle (i.e. during at least one of its life stages) must be accounted for when describing and identifying EFH (National Marine Fisheries Service, 2002).

Authority to implement the MSA is given to the Secretary of Commerce through NMFS. The MSA requires federal agencies to consult with NMFS on activities that may adversely affect EFH or when NMFS independently learns of a federal activity that may adversely affect EFH. The MSA defines an adverse effect as "any effect that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions" (50 C.F.R §600.810).

7.1.9 Marine Mammal Protection Act

The Marine Mammal Protection Act (16 U.S.C. 1361, et seq.) gives the USFWS and NMFS co-authority and outlines prohibitions for the taking of marine mammals. A take means to attempt as well as to actually harass, hunt, capture, or kill any marine mammal. Subject to certain exceptions, the act establishes a moratorium on the taking and importation of marine mammals. Exceptions to the taking prohibition allow USFWS and NMFS to authorize the incidental taking of small numbers of marine mammals in certain instances.

7.1.10 National Marine Sanctuaries Act

The National Marine Sanctuaries Act (NMSA) 16 U.S.C. § 1431 et seq. authorizes the Secretary of Commerce to designate as National Marine Sanctuaries areas of the marine environment that possess conservation, recreational, ecological, historical, research, and educational, or aesthetic resources and qualities of national significance, and to provide a comprehensive management and protection of these areas. To protect the area designated, any federal action that is likely to destroy, cause the loss of, or injure a sanctuary resource must consult with the Secretary of Commerce prior to commencement of the action and adhere to reasonable and prudent alternatives set by the Secretary of Commerce. To the extent practicable, consultation may be consolidated with other consultation efforts under other federal laws, such as the Endangered Species Act.

The NMSA allows the Secretary to issue regulations for each sanctuary designated and the system as a whole that, among other things, specify the types of activities that can and cannot occur within the sanctuary. The Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) was signed into law in November 1992. The Final EIS/Management Plan was released March 1997, and the final rule was published November 1999. The sanctuary includes specific areas from the coast of the Hawaiian Islands seaward to the 100-fathom isobath.

7.2 Permits and Consultations

The State Programmatic General Permit will seek to include a range of permitting requirements into a single program, thereby helping to facilitate program activities for communities and practitioners who may otherwise lack the financial resources necessary to complete the extensive permitting process.

7.2.1 U.S. Army Corps of Engineers Regional General Permit

Regional General Permits are used to authorize similar activities that cause only minimal individual and cumulative environmental impacts. Regional General Permits are developed by individual districts to streamline project review by minimizing duplication of other federal, state, and local review processes, while still protecting aquatic resources. Regional General Permits may be restricted for use in areas as small as a single residential development, a county, a region of the state, or the entire district.

State of Hawai‘i, Department of Health, Clean Water Branch (DOH) Requirements

The State of Hawai‘i Department of Health (DOH) Clean Water Branch (CWB) administers the Clean Water Act § 401 Water Quality Certification program. The State of Hawai‘i § 401 Water Quality Certification program is further administered by Hawai‘i Administrative Rules § 11-54. Under these administrative rules, activities like those proposed under this program that are minor and non-controversial are eligible for a waiver from water quality certification requirements. Specifically, HAR § 11-54-9.1.04 (b) states: “If the discharge resulting from an activity receives a determination to be covered under a nationwide permit authorization, thereby fulfilling specific conditions of that permit pursuant to 33 CFR Sections 330.4, 330.5, and 330.6 then the State of Hawai‘i Director of Health will determine, on a case-by-case basis, which projects are considered minor and non-controversial. Certification requirements of Section 11-54-9.1 shall be waived for minor and non-controversial activities within one year of receipt of a complete water quality certification application.”

National Historic Preservation Act (NHPA) Compliance

Section 106 of the National Historical Preservation Act addresses the need for federal agencies to take into account impacts, if any, that undertakings have on historic properties. Protection of Historic Properties and Section 106 analysis are regulated under 36 CFR Part 800. This part provides guidelines as to conducting an analysis in assessing when and how to undergo Section 106 review.

The first step in initiating the Section 106 process constitutes determining whether or not a proposed federal action is an undertaking as defined in 36 CFR §800.16(y), which states: “*Undertaking* means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those required a federal permit, license or approval.”

It is likely to be determined that this proposed action is an undertaking as defined in §800.16(y). The proposed project areas include the coastal land areas, shoreline areas, and nearshore ocean waters within the State of Hawai‘i where beaches are located. NHPA Section 106 requires the agency to “take into account the effect of (an) undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register (of Historic Places.)” 16 U.S.C. § 470f. NHPA section 101(d)(6)(B) requires agency officials to consult with any Native Hawaiian organization that attaches religious and cultural significance to historic properties that may be affected by an undertaking, regardless of the location of the property. 36 CFR §800.16 provides the following definition of a “historic property”:

> *Historic property* means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

There may be sites within the geographic area that would meet this definition of historic properties, including, but not limited to: sites related to traditional Hawaiian navigation and other seafaring traditions, traditional Hawaiian fishponds, koʻa (traditional Hawaiian fishing shrines typically consisting of piles of coral or stone), Hawaiian heiau (religious structures), Native Hawaiian burial sites, leina (places from which spirits leapt into the spirit world), and other cultural heritage properties. NHPA section 106 requires an agency to make a reasonable and good faith effort to identify historic properties, determine whether identified properties are eligible for listing on the National Register, assess the effects of the undertaking on any eligible historic properties found, determine whether the effect will be adverse, and avoid or mitigate any adverse effects. To this end, NHPA regulations require an agency to provide a Native Hawaiian organization, as a consulting party, with "a reasonable opportunity to identify its concerns about historic properties, advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, articulate its views on the undertaking's effects on such properties, and participate in the resolution of adverse effects" 36 CFR §800.2(c)(2)(ii)(A).

Section 106 of the National Historic Preservation Act (16 U.S.C. 470 et seq.) requires federal agencies to take into consideration the effects of their actions on significant cultural properties. Implementing regulations (36 CFR 800) specify a process of consultation to assist in satisfying this requirement. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register. The term "eligible for inclusion in the National Register" includes all properties that meet the National Register listing criteria specified in Department of Interior regulations at 36 CFR 60.4. Resources not formally evaluated may also be considered potentially eligible and, as such, are afforded the same regulatory consideration as listed properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as historic properties.

NHPA defines a historic property as any Pre-European contact or historic district, site, building, structure, or object included in, or eligible for listing on the National Register, including artifacts, records, and material remains related to such a property or resource (46 CFR 800, as amended 2006, Title III, Section 301, #5). The term "historic property" is used in the sense defined here throughout this document. The criteria for evaluating eligibility for listing on the National Register of Historic Places (NRHP) are as follows:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:
>
> 1. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> 2. That are associated with the lives of persons significant in our past; or
>
> 3. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that

represent a significant and distinguishable entity whose components may lack individual distinction; or

4. That have yielded, or may be likely to yield, information important in prehistory or history (National Parks Service, 1997).

To qualify for protection under NHPA, a cultural resource must meet the rigorous criteria for National Register eligibility, thereby qualifying as an historic property.

The Code of Federal Regulations outlines the process for identifying historic properties in 36 CFR § 800.4:

(a) ***Determine scope of identification efforts.*** In consultation with the SHPO/THPO, the agency official shall:

(1) Determine and document the area of potential effects, as defined in § 800.16(d);
(2) Review existing information on historic properties within the area of potential effects, including any data concerning possible historic properties not yet identified;
(3) Seek information, as appropriate, from consulting parties, and other individuals and organizations likely to have knowledge of, or concerns with, historic properties in the area, and identify issues relating to the undertaking's potential effects on historic properties; and
(4) Gather information from any Indian tribe or Native Hawaiian organization identified pursuant to § 800.3(f) to assist in identifying properties, including those located off tribal lands, which may be of religious and cultural significance to them and may be eligible for the National Register, recognizing that an Indian tribe or Native Hawaiian organization may be reluctant to divulge specific information regarding the location, nature, and activities associated with such sites. The agency official should address concerns raised about confidentiality pursuant to § 800.11(c).

(b) ***Identify historic properties.*** Based on the information gathered under paragraph (a) of this section, and in consultation with the SHPO/THPO and any Indian tribe or Native Hawaiian organization that might attach religious and cultural significance to properties within the area of potential effects, the agency official shall take the steps necessary to identify historic properties within the area of potential effects.

(1) ***Level of effort.*** The agency official shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. The agency official shall take into account past planning, research and studies, the magnitude and nature of the undertaking and the degree of federal involvement, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the area of potential effects. The Secretary's standards and guidelines for identification provide guidance on this subject. The agency official should also consider other applicable professional, state, tribal, and local laws, standards, and guidelines. The agency official shall take into account any confidentiality concerns raised by Indian tribes or Native Hawaiian organizations during the identification process.
(2) ***Phased identification and evaluation.*** Where alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency

official may use a phased process to conduct identification and evaluation efforts. The agency official may also defer final identification and evaluation of historic properties if it is specifically provided for in a memorandum of agreement executed pursuant to § 800.6, a programmatic agreement executed pursuant to § 800.14(b), or the documents used by an agency official to comply with the National Environmental Policy Act pursuant to § 800.8. The process should establish the likely presence of historic properties within the area of potential effects for each alternative or inaccessible area through background research, consultation and an appropriate level of field investigation, taking into account the number of alternatives under consideration, the magnitude of the undertaking and its likely effects, and the views of the SHPO/THPO and any other consulting parties. As specific aspects or locations of an alternative are refined or access is gained, the agency official shall proceed with the identification and evaluation of historic properties in accordance with paragraphs (b)(1) and (c) of this section.

(c) ***Evaluate historic significance***.

(1) ***Apply National Register criteria.*** In consultation with the SHPO/THPO and any Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to identified properties and guided by the Secretary's standards and guidelines for evaluation, the agency official shall apply the National Register criteria (36 CFR part 63) to properties identified within the area of potential effects that have not been previously evaluated for National Register eligibility. The passage of time, changing perceptions of significance, or incomplete prior evaluations may require the agency official to reevaluate properties previously determined eligible or ineligible. The agency official shall acknowledge that Indian tribes and Native Hawaiian organizations possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them.

(2) ***Determine whether a property is eligible.*** If the agency official determines any of the National Register criteria are met and the SHPO/THPO agrees, the property shall be considered eligible for the National Register for section 106 purposes. If the agency official determines the criteria are not met and the SHPO/THPO agrees, the property shall be considered not eligible. If the agency official and the SHPO/THPO do not agree, or if the Council or the Secretary so request, the agency official shall obtain a determination of eligibility from the Secretary pursuant to 36 CFR part 63. If an Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to a property off tribal lands does not agree, it may ask the Council to request the agency official to obtain a determination of eligibility.

(d) ***Results of identification and evaluation***

(1) ***No historic properties affected.*** If the agency official finds that either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them as defined in § 800.16(i), the agency official shall provide documentation of this finding, as set forth in § 800.11(d), to the SHPO/THPO. The agency official shall notify all consulting parties, including Indian tribes and Native Hawaiian organizations, and make the documentation available for public inspection prior to approving the undertaking.

(i) If the SHPO/THPO, or the Council if it has entered the section 106 process, does not object within 30 days of receipt of an adequately documented finding, the agency official's responsibilities under section 106 are fulfilled.
(ii) If the SHPO/THPO objects within 30 days of receipt of an adequately documented finding, the agency official shall either consult with the objecting party to resolve the disagreement, or forward the finding and supporting documentation to the Council and request that the Council review the finding pursuant to paragraphs (d)(1)(iv)(A) through (d)(1)(iv)(C) of this section. When an agency official forwards such requests for review to the Council, the agency official shall concurrently notify all consulting parties that such a request has been made and make the request documentation available to the public.
(iii) During the SHPO/THPO 30 day review period, the Council may object to the finding and provide its opinion regarding the finding to the agency official and, if the Council determines the issue warrants it, the head of the agency. A Council decision to provide its opinion to the head of an agency shall be guided by the criteria in appendix A to this part. The agency shall then proceed according to paragraphs (d)(1)(iv)(B) and (d)(1)(iv)(C) of this section.
(iv)(**A**) Upon receipt of the request under paragraph (d)(1)(ii) of this section, the Council will have 30 days in which to review the finding and provide the agency official and, if the Council determines the issue warrants it, the head of the agency with the Council's opinion regarding the finding. A Council decision to provide its opinion to the head of an agency shall be guided by the criteria in appendix A to this part. If the Council does not respond within 30 days of receipt of the request, the agency official's responsibilities under section 106 are fulfilled.

(B) The person to whom the Council addresses its opinion (the agency official or the head of the agency) shall take into account the Council's opinion before the agency reaches a final decision on the finding.

(C) The person to whom the Council addresses its opinion (the agency official or the head of the agency) shall then prepare a summary of the decision that contains the rationale for the decision and evidence of consideration of the Council's opinion, and provide it to the Council, the SHPO/THPO, and the consulting parties. The head of the agency may delegate his or her duties under this paragraph to the agency's senior policy official. If the agency official's initial finding will be revised, the agency official shall proceed in accordance with the revised finding. If the final decision of the agency is to affirm the initial agency finding of no historic properties affected, once the summary of the decision has been sent to the Council, the SHPO/THPO, and the consulting parties, the agency official's responsibilities under section 106 are fulfilled.

(D) The Council shall retain a record of agency responses to Council opinions on their findings of no historic properties affected. The Council shall make this information available to the public.

(2) ***Historic properties affected.*** If the agency official finds that there are historic properties which may be affected by the undertaking, the agency official shall notify all consulting parties, including Indian tribes or Native Hawaiian organizations, invite their views on the effects and assess adverse effects, if any, in accordance with § 800.5.

If a cultural resource can be demonstrated to meet the criteria for listing on the NRHP, it qualifies as an historic property, and effects to that historic property must be avoided or mitigated appropriately. Historic properties are protected from both indirect and direct effects. Indirect effects diminish some significant aspect of the historic property, but do not physically alter it. Direct effects physically alter the historic property in some way. The Area of Potential Effect (APE) is the area within which the proposed undertaking has the potential to either directly or indirectly affect historic properties that may be present. If an effect on a historic property is identified within the APE, consulting parties must agree on whether the effect is adverse. If an effect is adverse, either avoidance of the effect or mitigation for the effect is required under NHPA.

Endangered Species Act, Section 7 Consultation
Federally funded programs at the state and local level, such as some habitat restoration projects, require a Section 7 consultation process, which includes a biological assessment. Each federal agency must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species in the wild, or destroy or adversely modify its critical habitat.

Magnuson-Stevens Fishery Conservation and Management Act
The PIRO NMFS Habitat Conservation Division coordinates with state and federal agencies to conserve EFH. As per the Magnuson-Stevens Fishery Conservation and Management Act (MSA), federal agencies which fund, permit, or undertake activities that may adversely affect EFH are required to consult with the NMFS.

Fish and Wildlife Coordination Act
Under the Fish and Wildlife Coordination Act, USACE would be required to first consult with the USFWS and the NOAA NMFS, as well as with state fish and wildlife agencies regarding the effects on fish and wildlife resources and measures to mitigate these effects.

7.2.2 Conservation District Use Permit

Conservation District Use Permits (CDUP) are required for all land uses taking place in the State Land Use Conservation District. This includes all submerged lands out to three miles. Conservation regulations and permitting procedures are covered in HAR § 13-5, as authorized under HRS § 183C-3. Pursuant to HAR § 13-5, Land Use means:

1. The placement or erection of any solid material on land if that material remains on the land more than thirty days, or which causes a permanent change in the land area on which it occurs;

2. The grading, removing, harvesting, dredging, mining, or extraction of any material or natural resource on land;

3. The subdivision of land; or

4. The construction, reconstruction, demolition, or alteration of any structure, building, or facility on land.

7.2.3 Coastal Zone Management Consistency Determination

Considering shoreline armoring is either prohibited or heavily discouraged under the Hawai‘i Coastal Zone Management Act (CZMA) due to its effect on beaches, the most recent version of the Hawai‘i Ocean Resources Management Plan emphasizes DLNR’s role in (1) developing programs for beach nourishment, (2) streamlining the beach nourishment regulatory process, and (3) providing public-private partnerships for beach restoration. CZMA federal consistency regulations (15 CFR Part 930) establish procedures for states to issue general concurrences (15 CFR §930.53(b)) allowing similar minor work in the same geographic area to avoid repeated review of minor federal license or permit activities which, while individually inconsequential, cumulatively affect any coastal use or resource. Federal permit activities which satisfy the conditions of the general concurrence are not subject to the consistency certification and review requirements of 15 CFR Part 930, Subpart D - Consistency for Activities Requiring a Federal License or Permit.

7.2.4 National Environmental Policy Act Compliance

The USACE permit regulation (33 CFR 320-330) provides that general permits can be issued only for activities that are substantially similar in nature, and that cause only minimal individual or cumulative adverse environmental impact. Based on a preliminary assessment of the impacts of the general permit, the District Engineer may make a determination that issuance of the general permit would not result individually or cumulatively in a significant effect on the natural or human environment. Therefore, under the provisions of the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347) a Federal Environmental Impact Statement would not be prepared.

8 LIST OF AGENCIES CONSULTED

On September 29, 2017, an Interagency Scoping Meeting was held at DLNR's office in Honolulu to discuss the development of this Programmatic Environmental Assessment (PEA) in support of the proposed Small Scale Beach Restoration (SSBR) Program. Attendees included representatives from federal and state resource agencies including the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, Department of Health, Department of Land and Natural Resources, Office of Environmental Quality Control, and the Coastal Zone Management. The meeting's primary objective was to bring agency representatives together to discuss the proposed development of a statewide PEA that will serve as a mechanism to provide a streamlined permitting approach that will allow for the implementation of coastal erosion control projects that will result in ecosystem restoration and improved public shoreline access while maintaining Hawaii's visitor-based economy. Through the release of this Draft PEA, it is anticipated that additional agencies at both the state and federal level will be consulted. Comments on this draft by any agency will be accepted and incorporated into the Final PEA.

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APPENDIX A
SITE VISITS

1 Introduction

The Hawaiian shoreline is extremely diverse, consisting of rocky headlands, small pocket beaches, and long stretches of open coast. Although all of these coastal sites are impacted by sea level rise to some degree, it is the sandy coastline that is most vulnerable. The dynamic nature of sand and its ability to be transported alongshore and offshore by waves and currents renders beaches susceptible to erosion. The Small Scale Beach Restoration (SSBR) program is proposed to facilitate actions necessary to manage erosion and mitigate sea level rise related impacts so that Hawaii's limited beach resource can be conserved for future generations.

2 Background

The Department of Land and Natural Resources (DLNR) Coastal Erosion Management Plan promotes beach nourishment as a tool that can be used to manage erosion. The DLNR currently authorizes small-scale beach nourishment projects under its Small Scale Beach Nourishment (SSBN) program. The SSBN program consists of two relatively simple beach nourishment categories; Category 1 projects are limited to the placement of 500 cubic yards of sand, while the larger Category 2 projects are limited to the placement of 10,000 cubic yards of sand. However, due to regulatory issues, applicants are currently constrained to placing sand above the high water line. Proper restoration of a degraded beach system and management of coastal erosion requires placement of sand across the entire beach profile, both above and below the water line.

3 Scope of Work

Site visits were conducted at the direction of the Office of Conservation and Coastal Lands (OCCL) to identify the types of project sites and actions to be included within the proposed SSBR program. The goal of these site visits was to develop an understanding of what aspects of the SSBN program met the needs of stakeholders and where improvements could be made. This information, combined with the review of project specifications and performance, were used to define the siting and categories of projects to be included within the proposed SSBR program.

4 Observations

Site visits were conducted on the Islands of Oʻahu and Maui over the course of two days. Perceived needs, concerns, and benefits of existing and potential projects were discussed during the site visits. A summary of the sites visited and actions identified for inclusion in the proposed SSBR program are detailed in the following sections.

4.1 Oʻahu

Oʻahu site visits were conducted April 26, 2017. Sites visited included Waikīkī, Kailua, Punaluʻu, Sunset Beach, and Haleʻiwa. A map showing the location of these sites is provided in Figure 1, while site descriptions and actions identified for inclusion within the proposed SSBR program are summarized in the following sections.

Figure 1. O‘ahu Site Visit Map

4.1.1 Waikīkī

Waikīkī is located on the south shore of O‘ahu. The beach and shoreline are completely engineered, consisting of an intermixed variety of sand retention structures, seawalls, and open beach (Figure 2). Considering seasonal reversals in the transport of sand alongshore and the influence that coastal structures have on this transport, beach management actions such as sand pushing, backpassing, and bypassing were identified as actions to include within the proposed program. Moreover, the history of beach nourishment projects constructed along the Waikīkī shoreline demonstrate the need for repeat and planned nourishment events to manage erosion and maintain sandy beach in developed areas.

Figure 2. Waikīkī Shoreline

4.1.2 Kailua

Kailua is located on the windward side of Oʻahu. The natural beach within the Kailua Bay complex is bounded by two distinct rocky headlands, Kapoho Point to the north and Alāla Point to the south (Figure 3). Sand eroded from the southern extent of Kailua Beach is transported towards the center of the bay and typically plugs the mouth of the low flow Kaʻelepulu Stream. Considering the loss of beach near the boat ramp caused by a lack of an adjacent sand source, a beach management action such as backpassing sand cleared from the stream mouth (i.e. beneficial reuse) was identified as a component to include within the proposed program.

Figure 3. Kailua Beach Park

4.1.4 Punaluʻu

Punaluʻu is located on the windward side of Oʻahu. The open coast natural beach is chronically eroding and has lost significant beach width adjacent to a hardened shoreline (Figure 4). Considering the limited exposure to open ocean waves, due to the offshore protective reef, and the small active profile height, beach nourishment with sand stabilization structures was identified as an action to include within the proposed program.

Figure 4. Punaluʻu Beach Erosion

4.1.6 Sunset Beach

Sunset Beach is located on the north shore of O‘ahu. The open coast natural beach is directly exposed to offshore waves, which results in catastrophic erosion along this stretch of beach (Figure 5). Considering the significant runup experienced at the site, beach slope degradation due to foot traffic, and seasonal reversals in the transport of sand alongshore, beach management actions such as sand pushing and backpassing were identified as components to include within the proposed program.

Figure 5. Sunset Beach Erosion

4.1.8 Haleʻiwa

Haleʻiwa is located on the north shore of Oʻahu. The reef protected embayment at Haleʻiwa Beach Park has lost the beach fronting the comfort station seawall. Loss of beach sand fronting the seawall has resulted in undermining and structural failures (Figure 6). Considering its location relative to Haleʻiwa Harbor, a beach management action such as nourishment using sand cleared from the harbor (i.e. beneficial reuse) was identified as a component to include within the proposed program. Moreover, nearshore sand deposits have been located and may be a possible source of beach compatible material, suggesting that nearshore sand recovery should also be included within the proposed program.

Figure 6. Haleʻiwa Beach Erosion

4.3 Maui

Maui site visits were conducted May 5, 2017. Sites visited included Stable Road, Sugar Cove, Kūʻau, Halama Street, Maui Bay Villas, and Kīhei. A map showing the location of these sites is provided in Figure 7, while site descriptions and actions identified for inclusion within the proposed SSBR program are summarized in the following sections.

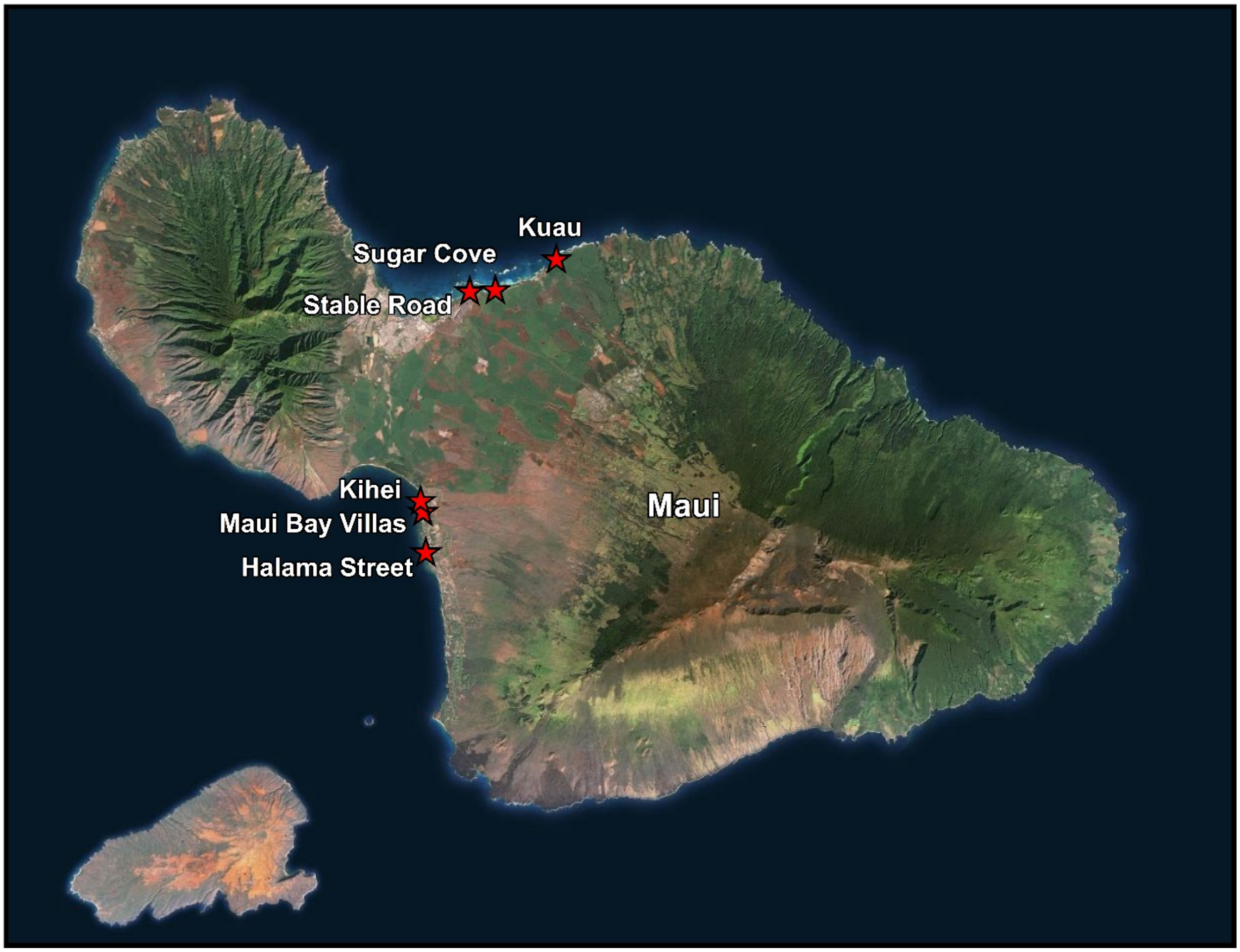

Figure 7. Maui Site Visit Map

4.3.2 Stable Road

Stable Road is located on the north shore of Maui. The open coast natural beach was chronically eroding and lost significant beach width. Considering the limited exposure to open ocean waves, due to offshore protective reef, and the small active profile height, beach nourishment with sand stabilization structures was identified as an erosion management solution that was permitted and constructed under the SSBN program (Figure 8). A series of low-profile groins were constructed to help stabilize sand placed on the beach that was recovered from nearshore inter-reef deposits. Considering the success of this project, these actions (beach nourishment, nearshore sand recovery, sand stabilization structures) should be included within the proposed program.

Figure 8. Stable Road Project

4.3.4 Sugar Cove

Sugar Cove is located on the north shore of Maui. Nearshore waters were impacted by the release of fine sediment from the exposed clay bank when all sand eroded from this embayed natural beach. The Sugar Cove AOAO (Association) restored the beach in 1995 and periodically nourishes the beach with upland sand to manage erosion and maintain water quality (Figure 9). Considering the success of this project, actions such as beach nourishment (initial restoration and periodic placement) using upland sand should be included within the proposed program.

Figure 9. Sugar Cove Project

4.3.6 Kūʻau

Kūʻau is located on the north shore of Maui. Beach nourishment projects using upland sand have been permitted and constructed within this natural beach embayment to limit exposure and release of fine terrestrial sediment to nearshore waters. However, chronic erosion has impacted additional locations within the embayment such that exposed fine terrestrial sediment may be released to nearshore waters during storm and high water events (Figure 10). Considering the success of previous projects and the potential for fine terrestrial sediment along unprotected portions of the shoreline to be released and impact nearshore water quality, actions such as beach restoration using upland sand should be included within the proposed program.

Figure 10. Kūʻau Erosion

4.3.8 Halama Street

Halama Street is located on the south shore of Maui. The open coast natural beach is chronically eroding and has lost significant beach width adjacent to a hardened shoreline. This stretch of beach depicts the classic hardened shoreline response scenario; seawall construction leads to adjacent beach loss, often resulting in a shoreline littered with sand bags placed as an emergency response measure (Figure 11). The beach downdrift of the sand bags is depleted, due to a lacking sand source, but approaches its natural size when moving outside the influence of the hardened shoreline (Figure 12). Considering the apparent longshore transport in this area, actions such as a longer beach nourishment project with either sand stabilizing structures or a feeder beach should be included within the proposed program.

4.3.9 Maui Bay Villas

Maui Bay Villas is located on the south shore of Maui. A beach exists within an engineered embayment located between two rubble mound revetments (artificial headlands). Longshore sand transport could be reestablished for the area by filling the engineered embayment and placing sand in front of the adjacent revetments. This would require placement of sand across the entire beach profile, both above and below the water line. Considering the potential to positively impact adjacent beaches, both within the engineered embayment and downdrift of the artificial headlands (i.e. revetments), beach nourishment fronting hardened shorelines was identified as an action to include within the proposed program.

4.3.10 Kīhei

Kīhei is located on the south shore of Maui. The chronically eroding natural open coast beaches along this stretch of shoreline front a coastal highway and are periodically overtopped due to wave runup during high water and wave events. These open coast beaches have eroded to the point where any nourishment template would extend below the water line. Considering the potential to protect public infrastructure by reducing wave runup and thus limiting overtopping, beach nourishment with an engineered design section, and sufficient advanced fill to retain this design, was identified as an action to include within the proposed program.

5 Assessment

Sites identified for inclusion within the SSBR program include natural sandy beaches and pre-existing engineered beaches. Actions identified to support the needs of stakeholders include the following: sand pushing, sand backpassing, sand bypassing, beach nourishment (initial restoration and repeat maintenance events), nearshore sand recovery, upland sand placement, beneficial reuse (stream mouth and harbor clearing), and sand stabilization structures. In addition to including the actions identified above, the proposed program should also be developed to support community and littoral cell based sand management operations.

Figure 11. Halama Street Beach Loss (Top: Updrift, Bottom: Downdrift)

Figure 12. Halama Street Erosion (Top: Updrift, Bottom: Downdrift)

APPENDIX B
INTERAGENCY MEETING MINUTES

Interagency Meeting Minutes

The interagency scoping meeting for the proposed development of a Programmatic Environmental Assessment (PEA) to support the State of Hawaii's Small Scale Beach Restoration (SSBR) Program was held in Honolulu, HI on September 29, 2017 at 9AM. Attendees included representatives from Federal and State resource agencies including the US Army Corps of Engineers (USACE), US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Environmental Protection Agency (EPA), Department of Health (DOH), Department of Land and Natural Resources (DLNR), Office of Environmental Quality Control (OEQC), and Coastal Zone Management (CZM). Representatives from APTIM and Honua Consulting were also in attendance. The meeting's primary objective was to bring agency representatives together to discuss the proposed development of a State PEA that will serve as a mechanism to provide a streamlined permitting approach that will allow for the implementation of coastal erosion control projects that will result in ecosystem restoration and improved public shoreline access while maintaining Hawaii's visitor-based economy. The purpose of the PEA is to meet Chapter 343 requirements and to complete the application requirements for a statewide Conservation District Use Permit (CDUP) to authorize SSBR projects statewide. Moreover, it is intended that the PEA will be used by applicants to comply with environmental documentation requirements necessary to obtain Federal permits. This PEA will serve to evaluate the significance of potential environmental impacts that could result from SSBR projects statewide.

Sam Lemmo (DLNR-OCCL) started the meeting by reiterating the purpose of the meeting and the PEA. He then requested that all meeting attendees introduce themselves and state the name of the agency they represent.

Following introductions, the meeting began with a presentation by coastal engineer Andrew Wycklendt (APTIM). He first provided an overview of the importance of Hawaii's sandy beaches and followed with a description of their general condition. He highlighted the fact that the chronic erosion experienced at many of the State's sandy beaches is being exasperated by impacts associated with coastal armoring and sea level rise. Andrew then summarized a number of studies, recommendations, and legislation that set the stage for the development of a new Small Scale Beach Restoration (SSBR) program. He gave an overview of the proposed program's goals and objectives and stated that the program's geographic extent would span existing and formerly sandy beaches along the main Hawaiian Islands. Specifically, approved projects would be limited to areas extending seaward from the State Land line out to the historic beach profile located offshore. The activities eligible under the proposed SSBR program would include sand pushing, sand backpassing, sand bypassing, sand placement, sand dredging, use of upland sand, and sand stabilization structures. Andrew then provided an overview of each of these program elements and ended his presentation with a list of activities categorically excluded from the program. Activities identified for potential exclusion include dredge to stockpile, shoreline hardening (i.e. seawalls, revetments, etc.), use of imported or production sand, and the use of pulverized coral or rock.

Following Andrew's presentation, marine biologist Brad Rosov (APTIM) discussed aspects of the PEA with the group. He reviewed the draft purpose and need, highlighting that the PEA is intended to facilitate a streamlined permitting approach that will allow for the implementation of coastal erosion control projects which will help mitigate beach loss while protecting natural resources. He then described the four project alternatives to be evaluated in the PEA: No Action, Status Quo, Shore Hardening Only, and the Proposed Action. Brad then reviewed the draft PEA table of contents and provided a brief overview of a number of proposed Best Management Practices (BMPs) that may be included in the program to help limit any potential project related impacts. Brad concluded the presentation and asked for input from meeting participants regarding any concerns or suggestions that they may have.

Jessie Paahana (USACE) asked who the potential applicants would be for the program. Sam responded that both public and private entities (including homeowners and condominium associations) could be project applicants. Jessie then asked if the purpose of the PEA is to set up the permitting process of the program or to implement the beach restoration projects. Sam responded that the purpose of the PEA would be to establish the permitting process. John Nakagawa (CZM) then asked if the PEA will serve as a HEPA/NEPA compliance document for applicants or if applicants will be required to develop their own documents. Sam stated that the intent of the PEA is to serve as a compliant document for the State (HEPA) and that it would not be submitted as a joint 343/NEPA document. John also asked if the program will attempt to consolidate the processing and approval of the various required permits under one blanket permit administered by OCCL. Sam responded by stating that the former SSBN program included a Programmatic Agreement between CZM, DLNR, DOH, and USACE that facilitated a streamlined permitting process using the State Programmatic General Permit (SPGP). Sam added that it has yet to be determined exactly how the permitting process will be streamlined for this new SSBR program. John asked if the PEA would describe the consolidated regulatory approach. Sam responded that indeed it would and cited the Fishpond PEA as an example of how the SSBR PEA would be developed. Trisha Watson (Honua) stated that CZM completed their consistency statement for the Fishpond program, which established parameters for the actions under the program, before the PEA was developed. She indicated that the establishment of the framework for the program upfront contributed to the success of the Fishpond program. Tom Eisen (OEQC) asked if the PEA would serve an applicant directly. Sam responded that it would be used by a proposed applicant to the State. He added that perhaps the PEA may also have some concurrence from the Federal agencies as well, however, that has not been determined at this time.

Jessie then added that she was appreciative that the notion of “small” (as it relates to the “Small” Scale Beach Restoration Program) was going to be revisited in this PEA. She also stated that this clarification would be helpful to the USACE for the development of programmatic Section 7 EFH and Section 106 NEPA documents to assist with the issuance of the required Department of Army permits. Brad asked if the PEA could be submitted to the USACE and utilized as a NEPA document for consultation with NMFS and USFWS under Magnuson Stevens and Section 7, respectively. Joel Moribe (NMFS) responded that it would depend on the level of detail included in the PEA and if the information contained within would allow for a comprehensive evaluation. If sufficient data and information are not provided, additional documentation would be warranted. Joel then suggested that the document should include a robust description of the proposed actions and SSBR program. Jessie suggested that the PEA should be developed in parallel or concurrently with the determination of the permitting process.

Sam stated that a Water Quality Certification was issued for 5 years under the former SSBN program. He stated that DLNR would be interested in using the PEA for the issuance of another blanket Water Quality Certification. Ed Chen (DOH-CWB) responded by stating that the Water Quality Certification previously issued was not for the State permit, but was for the USACE SPGP. He also stated that some aspects of the Water Quality Certification were not fully carried out by the State due to miscommunication. Ed then mentioned that the Clean Water Branch is most concerned with the source and quality of the sand utilized for nourishment projects. In addition, Ed recommended that the PEA should clearly define what is meant by "restoration". As an example, he stated that the 1959 shoreline at Waikiki was highly eroded and, therefore, the program would most likely not aim to "restore" to that previous condition. Finally, Ed stated that, in general, the Department of Health supports beach nourishment to improve the State's beach environment for safety and health. Sam then stated that he agrees with Ed's comments and noted that water quality is a big concern and it will be addressed fully within the PEA.

Randy McIntosh (NOAA) asked about the timeline for completing the PEA and coordinating with agencies. Andrew responded that the goal is to develop a draft of the PEA by January and that conversations with agencies will continue throughout this time period. Brad added that a formalized commenting period would be included as part of the PEA process as well. Randy stated that some of the proposed actions within the PEA may already be covered by NOAA through existing permits with the USACE. Brad suggested that NOAA inform DLNR of specific actions that may already be permissible. John suggested that the regulatory process associated with the proposed actions should be sorted out sooner than later to avoid the PEA becoming outdated before it can be utilized.

Finn McCall (DLNR-DOBOR) noted that the presentation indicated that stockpiling dredged material would be excluded from the approved activities within the PEA. However, he was interested to know if temporary stockpiling could be included. Andrew responded that the program could explore the possibility of temporary stockpiling as the intention of the exclusion of sand stockpiling was to prevent the permanent removal of material from the system. Jessie then mentioned that the City and County has submitted a permit application to the UASCE for the removal of material from stream mouths. Because the intention of the backpassing action associated with the PEA includes the retention of the material removed from clogged stream mouths, she suggested coordinating with the City and State to ensure that the material removed under their permit is retained within the system. Sam stated that the removal of this sand from the littoral system is very problematic. John added that it is against State law to remove this material from the system and that the City and County has yet to coordinate with CZM for that action. Ed then stated that Clean Water Branch is working to streamline Section 401 requirements and that this PEA should lay out the proposed BMPs and SOPs that would help reduce project-induced water quality impacts to help facilitate the issuance of the Water Quality Certificates.

Sam reiterated to the group that they should contact APTIM or DLNR directly with any additional concerns or questions as the PEA is developed. Sam thanks all meeting attendees and adjourned the meeting at 11:30AM.

Interagency Meeting Attendees

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