STATE OF HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
Honolulu, Hawaiʻi

July 14, 2023

Board of Land and
Natural Resources
State of Hawaiʻi
Honolulu, Hawaiʻi

REGARDING: Informational briefing on the state of coastal lands in Waikīkī (non-action item) consisting of

1. A point-in-time "virtual site visit" of Waikīkī conducted by the Office of Conservation and Coastal Lands;
2. A presentation by the Waikīkī Beach Special Improvement District (WBSIDA) on the history of public-private partnerships in Waikīkī; and
3. A presentation by Sea Engineering, Inc. on the Programmatic Environmental Impact Statement for the Waikīkī Beach Improvement and Maintenance Program.

PRESENTERS: Office of Conservation and Coastal Lands; Waikīkī Beach Special Improvement District ;Sea Engineering Inc.

LOCATION: Coastal lands in the ahupuaʻa of Waikīkī, moku of Kona, Oʻahu

SUBZONE: Resource

ATTACHMENTS:
1. Waikīkī Virtual Tour
2. Selections from the draft Programmatic Environmental Impact Statement for the Waikīkī Beach Improvement and Maintenance Program: *Cover page and Executive Summary*, and *Ka Paʻakai Analysis*.

ONLINE LIBRARY: dlnr.hawaii.gov/occl/waikiki/

PURPOSE

In the coming months the Board of Land and Natural Resources (Board) will be asked to consider approving the Final Programmatic Environmental Assessment for the Waikīkī Beach Improvement and Maintenance Program. It is possible the Board will be asked to consider permits for projects related to this program as well as potential memorandums of understanding regarding public-private partnerships for those projects.

A Brief History

Prior to the Great Māhele of 1848 the ahupuaʻa of Waikīkī encompassed all the valleys of southeast Oʻahu from the west side of Makiki to the east side of Wailupe. The shoreline ran from today's Ala Moana Park to Paikō Lagoon. It was bounded by the ahupuaʻa of Honolulu to the west and the ahupuaʻa of Waimānalo to the east. Waikīkī held rich agricultural lands in the valleys, a network of wetlands and natural ponds nearer the coast, and important fishing grounds offshore.

The wetlands were fed by three major streams, Makiki, Mānoa, and Pālolo. They took new names after leaving the wetlands, entering the sea along the southwest shore of Māmala Bay as Piʻinaoi, ʻĀpuakēhau, and Kuekaunahi.

The coastal lands were the home to royal families of Oʻahu, and became the island's *de facto* center of government in 1450. The first known loko iʻa in Waikīkī were constructed by Chief Kalamakua around this time.

Kamehameha I landed his armies at Helumoa in Waikīkī in 1795. There is evidence that he greatly expanded agriculture in the area to feed his army. After the battle of Nuʻuanu Kamehameha I moved his capital from Lahaina to Waikīkī; it remained the kingdom's capital until it was relocated to Kou (Honolulu) in 1808.

Modern Development

The extension of the Waikīkī Road (now Kalākaua Avenue) in the mid-1800s opened the district up to development. Members of the royal family and assorted wealthy landowners all built homes here. In 1877 King Kalākaua opened Kapiʻolani Park near the base of Lēʻahi, and in 1888 the Park Beach Hotel was opened nearby. The dredging of offshore channels changed the current patterns along the coast, possible increasing erosion, and the first seawalls appeared in the late 1890s.

The first proposal to radically transform the landscape of Waikīkī came in a 1906 report by the President of the Board of Health, Lucius. E. Pinkham, entitled Reclamation of the Waikiki District: *For the making of Honolulu as beautiful and unique in character, as nature has endowed it in scenery, climate and location*. In the report Pinkham proposes using federal funds build an inland lagoon, and to dredge the offshore reef flat to fill in the wetlands and ponds in order to create a new residential district.

While Pinkham's made his proposal under the guise of public health, his concluding remarks make it clear that the main intent was economic development, and to replace a class of population "with limited means" with wealthier landowners:

> Waikiki, to the extent the beach front will permit, is the choice part of the city of Honolulu, for it offers the close attraction of the sea. The land bordering on the sea commands high prices and little can be secured. Other than a few lots on Kalakaua Avenue there are in the Waikiki district hundreds of acres that could be

> made, at comparatively small cost, exceedingly attractive and desirable by a comprehensive plan under governmental control that must otherwise remain of only agricultural value for rice and banana culture or valueless, or be gradually occupied by a class of population that limited means force onto undesirable and unsanitary land.
>
> If the owners of the property are broad minded and harmonious there is little doubt but in the course of time covering not many years, the whole place can be transformed into a place of unique beauty to the notable embellishment of Honolulu, to its reputation abroad, and to the profit of the property owners.

Federal attention was diverted away from Hawaiʻi by the San Francisco earthquake, delaying the implementation of Pinkham's plan. Nevertheless large areas of the coral reef flat were dredged over the subsequent years by both the U.S. military and private landowners. The coral rubble, as well as an unknown amount of beach sand, was used to fill the Kālia wetlands that now are occupied by Fort DeRussy. The Ala Wai Canal was dredged in the 1920s, diverting the streams into the canal and creating enough material to fill in the remaining wetlands.

Although seawalls were recognized by the Territorial government as the primary cause of beach erosion, and were prohibited in 1917, the ban was not enforced. Approximately 37 seawalls were constructed in Waikīkī, and by 1920 most of the shoreline was lined with walls. By the 1930s only a remnant strip of beach remained along much of the shoreline.

Large scale beach nourishment projects were initiated, creating or greatly expanding what would become Kaimana, Queen's Surf, Kapiʻolani, and Kūhiō Beaches. These beaches were built to follow the straight lines of the existing seawalls and roads rather than the natural contours of the original bay, and were held in place by a series of groins and breakwaters.

The Conservation District Use Permits (CDUPs) for the beach nourishment projects since 1973, as well as for other improvements, can be found in OCCL's online library at dlnr.hawaii.gov/occl/waikiki.

It is possible that at one time this shoreline along Māmala Bay acted as one littoral cell, that is, as one system of coastal processes. Today the groins and walls have broken it up into multiple cells. Meanwhile the physical boundaries have shrunk, and Waikīkī now generally refers to the area makai of the Ala Wai Canal, an approximately one square mile area with approximately 23,000 residents.

Presentation: A Virtual Tour of Waikīkī (April 23, 2023)

The Office of Conservation and Coastal Lands (OCCL) will take the Board on a "virtual tour" of the Waikīkī shoreline as it existed at a single point in time, April 23, 2023. We will cover the area from Kaimana in the east to Duke Kahanamoku Beach in the west. The slideshow of the tour is attached as **Exhibit 1**.

Presentation: Waikīkī Beach Special Improvement District on public-private partnerships in Waikīkī

In 2015 the Waikīkī Beach Special Improvement District (WBSIDA) was created by a City ordinance to preserve and restore Waikīkī Beach, and to serve as a cost-share partner in public-private partnerships. The WBSIDA district is bounded by Kapahulu Avenue, the Ala Wai Canal, and the Ala Wai Harbor. It is represented by stakeholders representing businesses, government, hotels and resorts, non-profit organizations, and scientists and engineers.

WBSIDA played a key role in the planning process that led to the Waikīkī Beach Improvement and Maintenance Program, and partnered with the Department of Land and Natural Resources in funding the Environmental Impact Statement for the program.

Presentation: Sea Engineering on the draft Programmatic Environmental Impact Statement for the Waikīkī Beach Improvement and Maintenance Program

A Programmatic Environmental Impact Statement (EIS) is designed to cover multiple projects, in order to better understand the cumulative and combined impacts as a whole. Individual projects might require additional environmental documents prior to the permitting stage.

In 2017 the Waikīkī Beach Community Advisory Committee (WBCAC) was formed to engage stakeholders to identify potential project areas and design criteria for beach improvement and maintenance projects in the area. This led to the development of the Waikīkī Beach Improvement and Maintenance Program.

Sea Engineering was selected as a consultant to develop a Programmatic EIS for the program, which evaluated the impacts of potential actions in four beach sectors: Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō Beach.

The Executive Summary, Introduction, and Ka Paʻakai Analysis are attached as **Exhibit 2**. Documents relating to the program, including the full draft EIS, are available at dlnr.hawaii.gov/occl/waikiki.

RECOMMENDATION

The Office of Conservation and Coastal Lands is presenting this report and the attached exhibits as a "non-action" item on the Board's Agenda. We have invited representatives from the Waikiki Beach Special Improvement District and from Sea Engineering to give brief presentations to the Board.

Respectfully submitted,

S Michael Cain

Michael Cain, Administrator
Office of Conservation and Coastal Lands

Approved for submittal,

Dawn N. S. Chang, Chairperson
Board of Land and Natural Resources

Waikīkī Beach Virtual Site Visit

Date of Site Visit: April 23, 2023
1 p.m. to 3 p.m.
Low tide: 11:01 am, -0.12 ft
High tide: 6:51 pm, 1.95 ft

Presentation by the Office of Conservation and Coastal Lands
to the Board of Land and Natural Resources, June 23, 2023

Waikīkī: Kahanamoku Beach to Kaimana Beach

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Tax Map Key Plat (1) 3-1-031

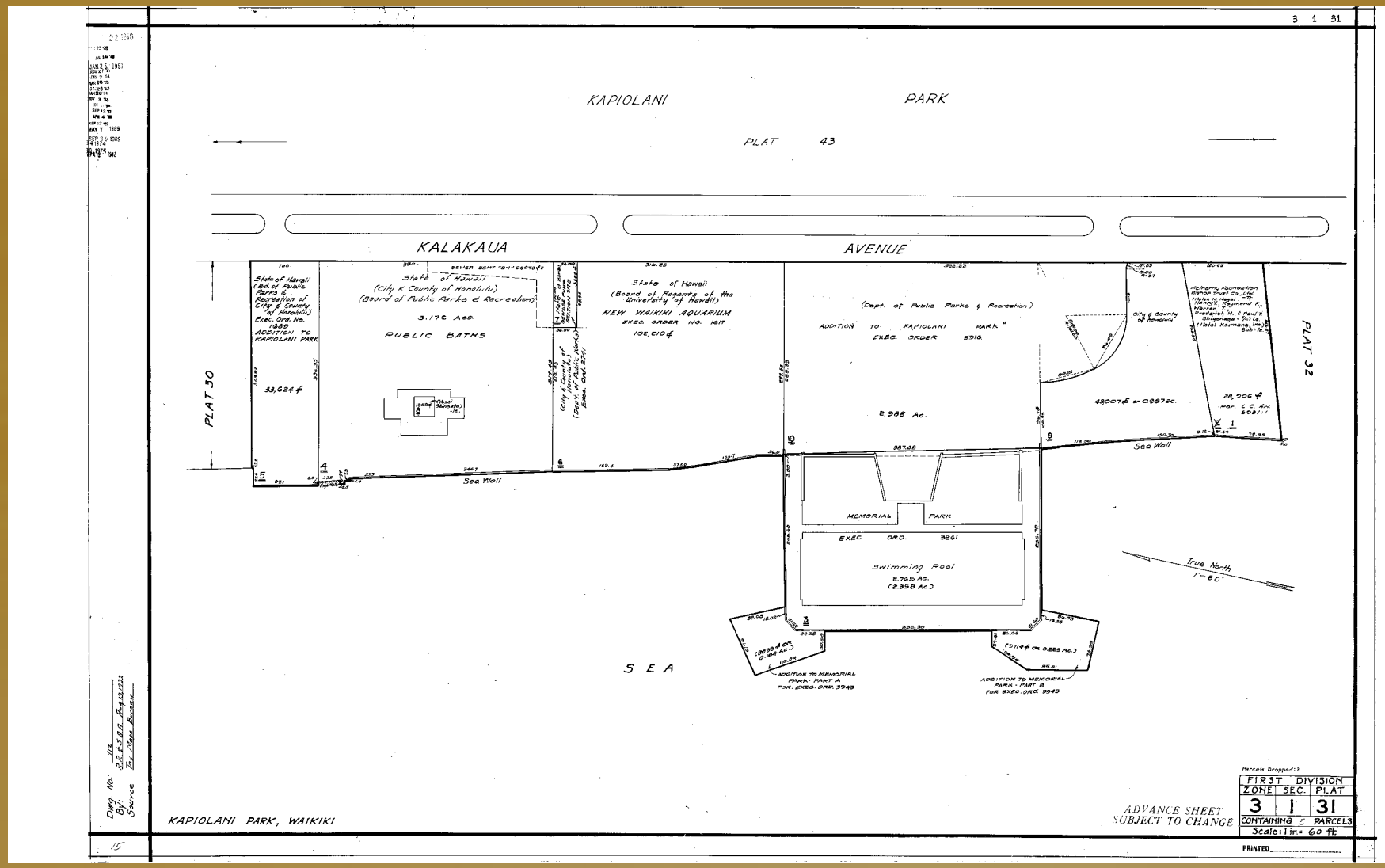

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Kapiʻolani Park I

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

A: Kaimana Beach

Kaimana was a narrow beach prior to 1928. The Waikīkī War Memorial Natatorium was completed in 1927, and it allowed a larger beach to grow. Kaimana is a popular beach for residents. On this day it was closed to protect a monk seal and her pup. The Kapua Channel offshore is used by swimmers and snorkelers, and is an entry/exit point for paddlers and surfers.

B: Aquarium Walkway

There is a shallow reef flat offshore extending approximately 35 yards, then a channel that was dredged in the 1930s to create a swimming basin. A narrow beach has formed fronting the seawall. The beach appears some years, and disappears other years. Parts of the seawall are failing, and the walkway is currently closed.

C: Former Public Baths

There is a 98-foot long protrusion along this section of the seawall that extends between twelve and twenty-seven feet seaward. Some records refer to it as a "planter box," while oral accounts state that it is a remnant of the public baths. The area was capped with concrete pavings in 2020. Waves frequently overtop the wall during the summer south-swell season. The Publics surf break is offshore.

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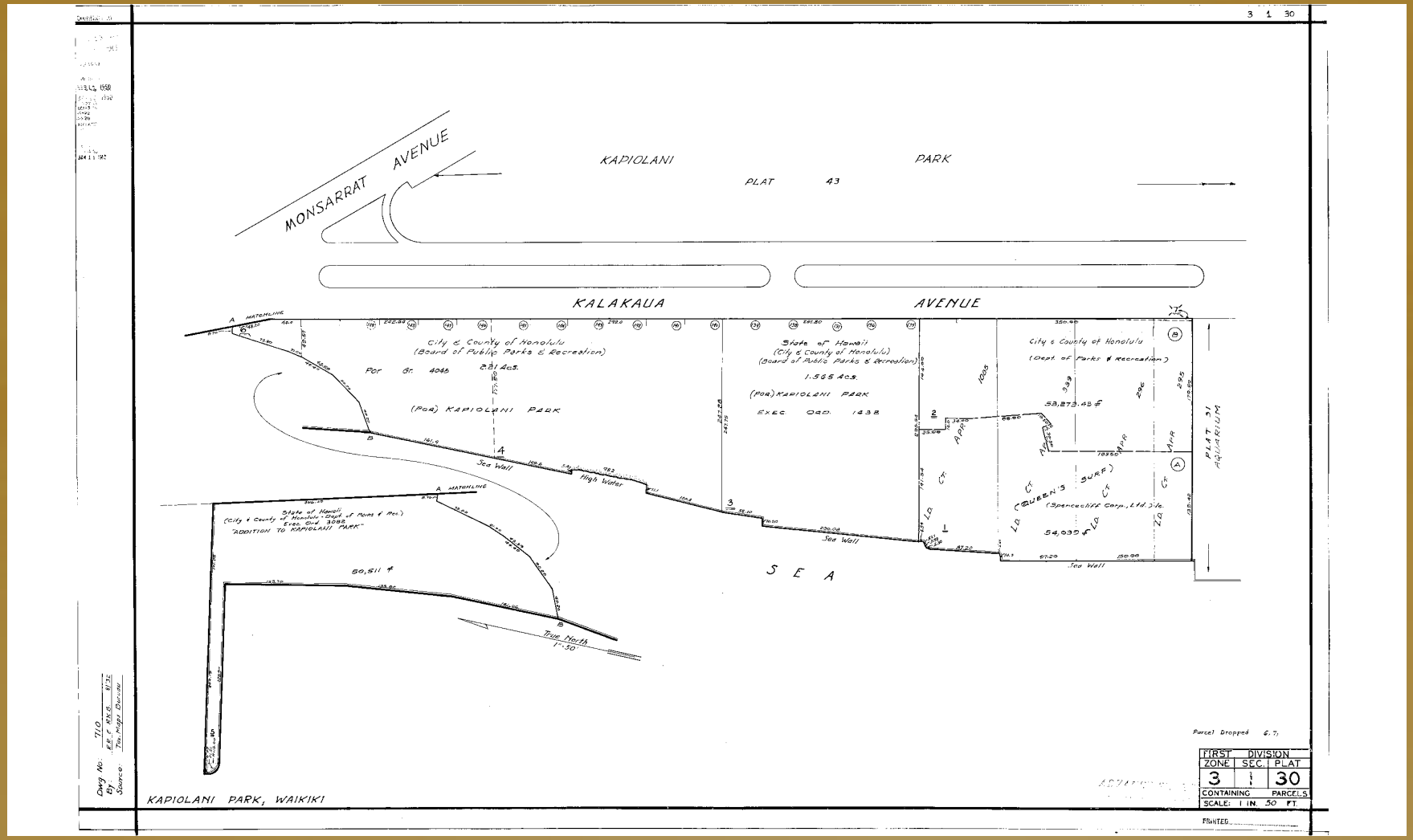

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Kapiʻolani Park II

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

D: Queen's Surf Beach

Queen's Surf Beach was named after Queen Kapiʻolani, who had a residence, Paoakalani, here. It was the site of Queen's Surf Nightclub after WWII, and in 1971 the City took the property in order to expand Kapiʻolani Park. At that time the beach was 200 feet wide. The beach was a popular gathering spot for Oʻahu's LGTBQ community through the 2010s, when the beach eroded significantly. The lifeguard tower was abandoned in 2020 due to severe beach loss.

E: Walls

This area has a wide stable sandy beach that is bounded and stabilized by the Kapahulu Groin. There is a fair amount of sharp coral rubble offshore. The groin was built in 1951 to both hold in a proposed new beach, and to channel stormwater; some accounts state that it the location of the former Kuekaunahi stream. The beach was built between 1950 and 1957. The break that runs along the groin is popular with bodyboarders.

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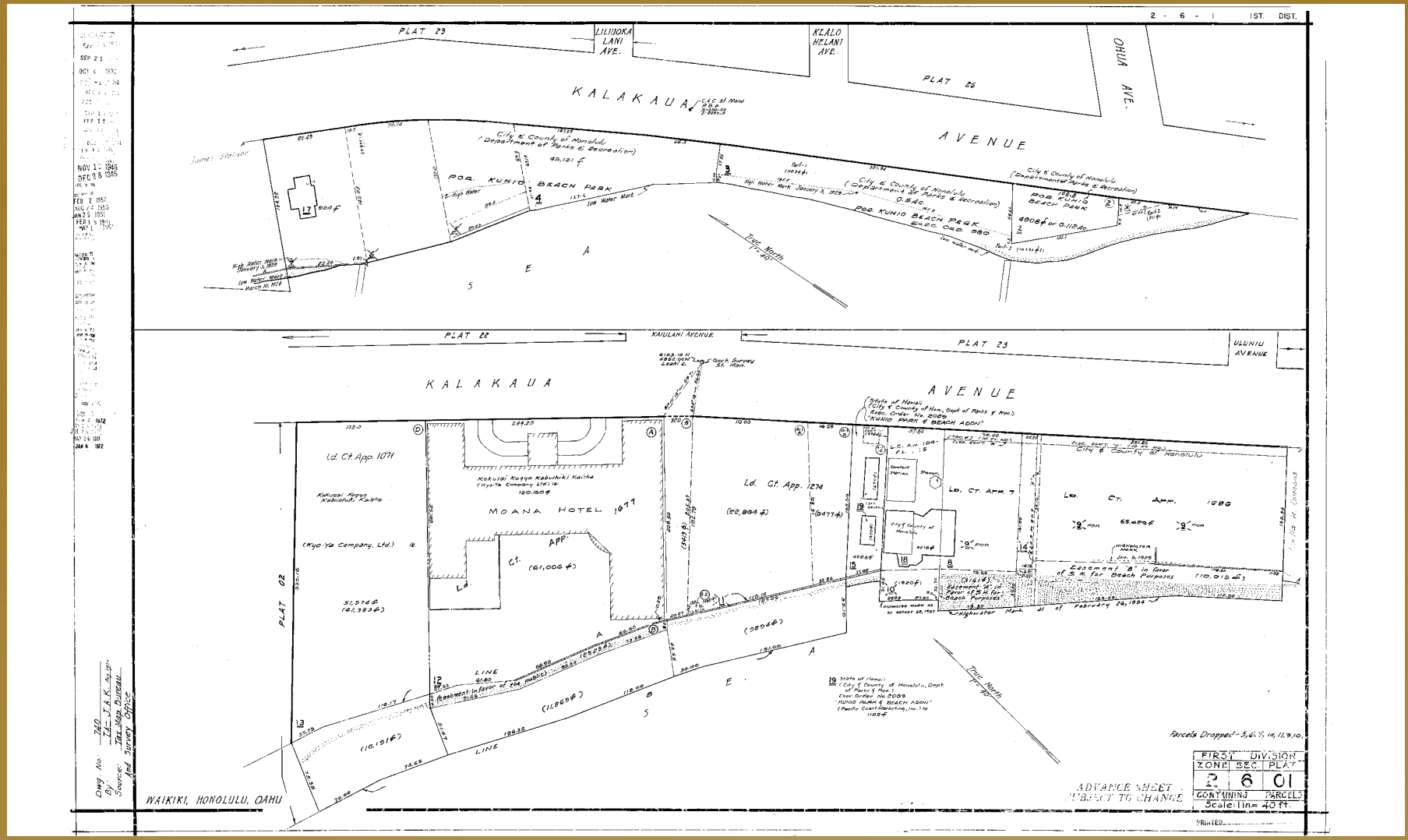


Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Kūhiō Beach and Kūhiō Beach Park

F: Kūhiō Beach Park: Diamond Head Basin

The Waikīkī Road (now Kalakaua Avenue) was built parallel to the shoreline in 1841, and a seawall was built sometime prior to 1890 to protect the road. In the 1930s break walls and groins were built to create swim basins, a dragline excavator was used to clear the basins of coral, and sand was brought in to create the beach. Today the waters are calm and shallow, and the beach is popular with families with young children. The Diamond Head side of the basin is submerged at high tide. Commercial operations have recently begun claiming beachfront areas.

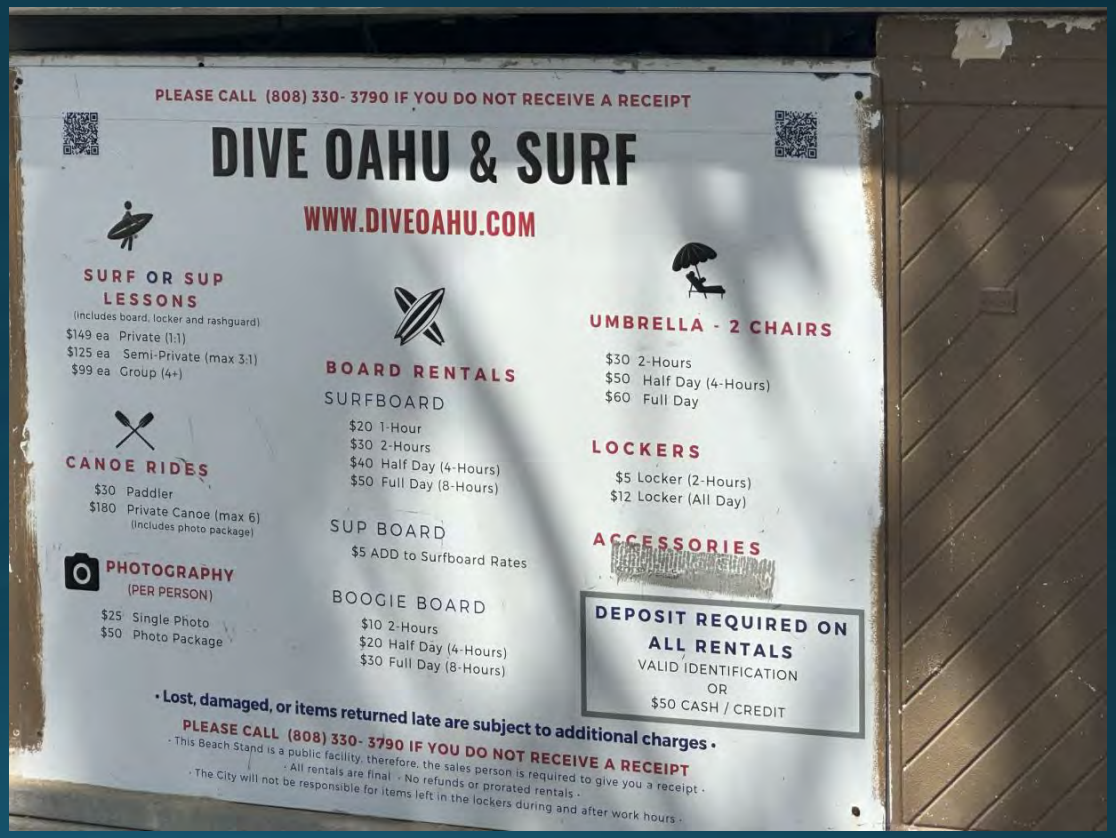
G: Kūhiō Beach Park: ʻEwa Basin

The ʻEwa Basin is partially open to the sea, and the central area of the beach experiences more erosion than the Diamond Head Basin. There are strong currents near the breakwater opening. The beach park was named after Prince Kūhiō Kalanianaʻole, who had his home near here.

H: Kūhiō Beach I

The transition area between the basins and the main Kūhiō Beach is not pedestrian friendly. Parts of the groin that separate the two areas have collapsed, and walkers need to climb rocks or detour around to cross between the areas. The sandbag stub groin was built in 2019 to replace several small concrete groins in the area, in order to minimize severe and localized erosion along the groin.

I: Kūhiō Beach II



The State partnered with private parties to nourish Kūhiō Beach in 2012 and 2021. Two years after the project the beach remains stable; a survey in April 2022 showed that it had gained an average of 37.1 feet in width, with an increase of approximately 65,000 square feet. Additional sand was brought inshore during a large south swell in July 2022. Currently the beach is dominated by commercial vendors, and little public space remains. The off-shore sand bar currently extends close to the Canoes surf break.

J: Kūhiō Beach III

The beach fronting the Moana Surfrider is the only section free of commercial vendors in this stretch of Waikīkī. The beach remains wide after nourishment. Paddling regattas are held here during the summer; in recent years the Diamond-Head race lanes have occasionally been closed due to the shallow sand bar offshore.

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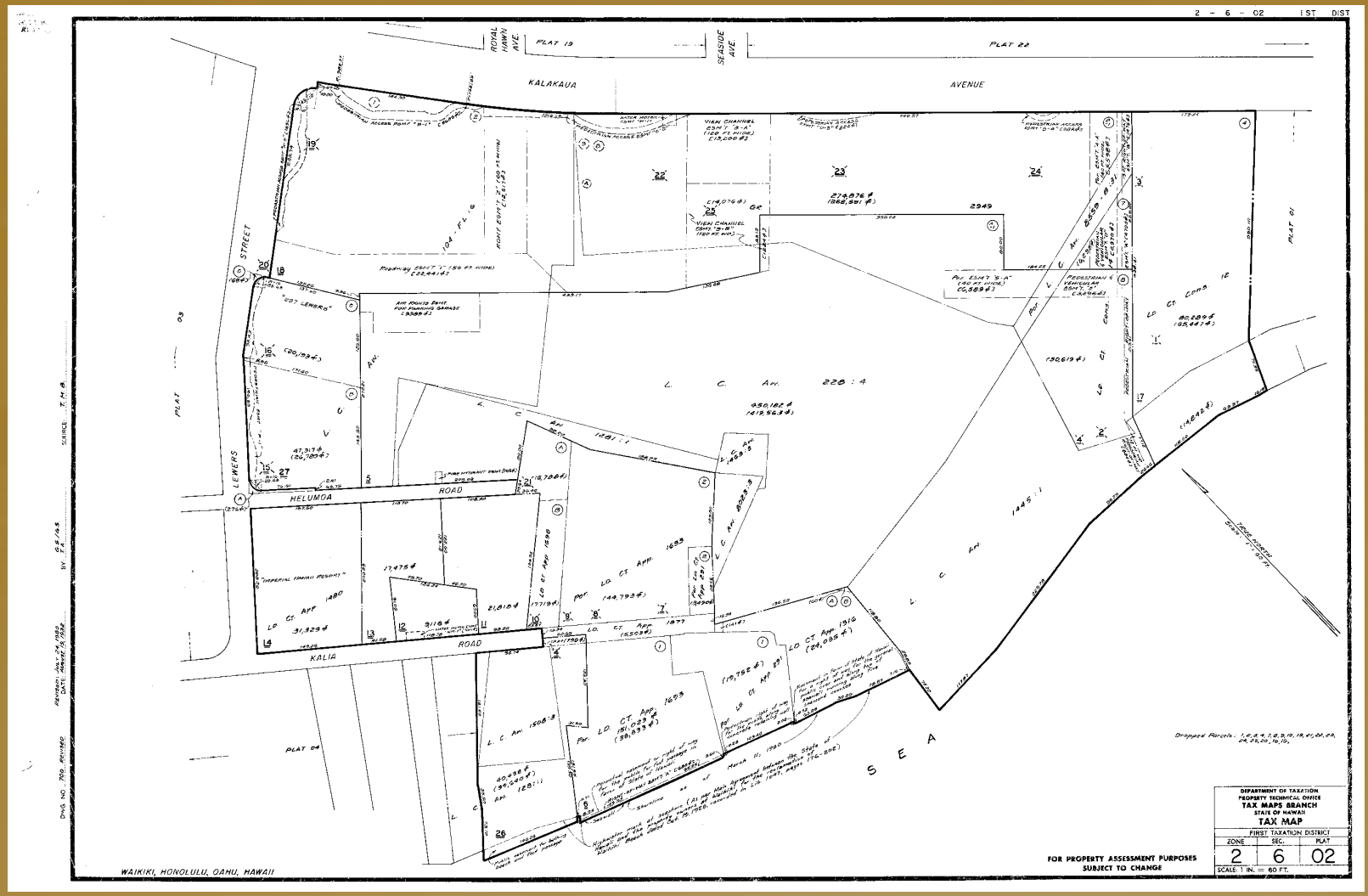


Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Helumoa

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

K: Helumoa

Kamehameha's army landed along this shoreline in 1795, and after the battle of Nu'uanu he transferred his capital from Lahaina to Helumoa. Helumoa remained the capitol of the kingdom until 1809, when it was moved to Kou (Honolulu). The beach is wide and stable, with a mix of commercial operations and open space for the public. Sand is accumulating along the Royal Hawaiian Groin, rebuilt in 2020, and a shallow sand bar extends offshore.

L: Walkways I

The seawall fronting the properties here are on private land. There are easements in favor of the State of Hawai'i for a pedestrian right-of-way along the tops of the seawall. The walkway was closed due to structural damage in 2008, and pedestrians are currently routed through the hotels.

Tax Map Key Plat (2) 2-6-004

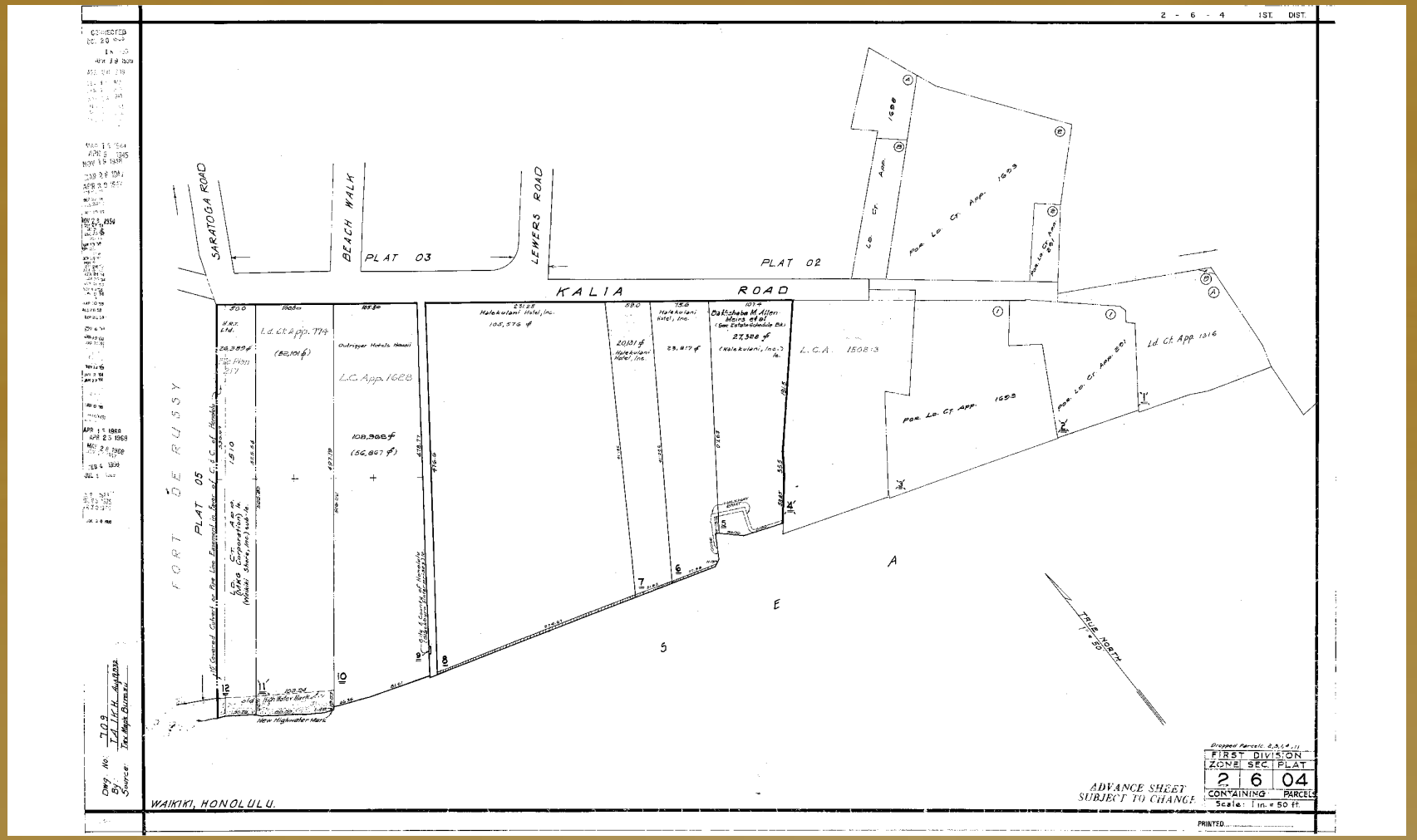


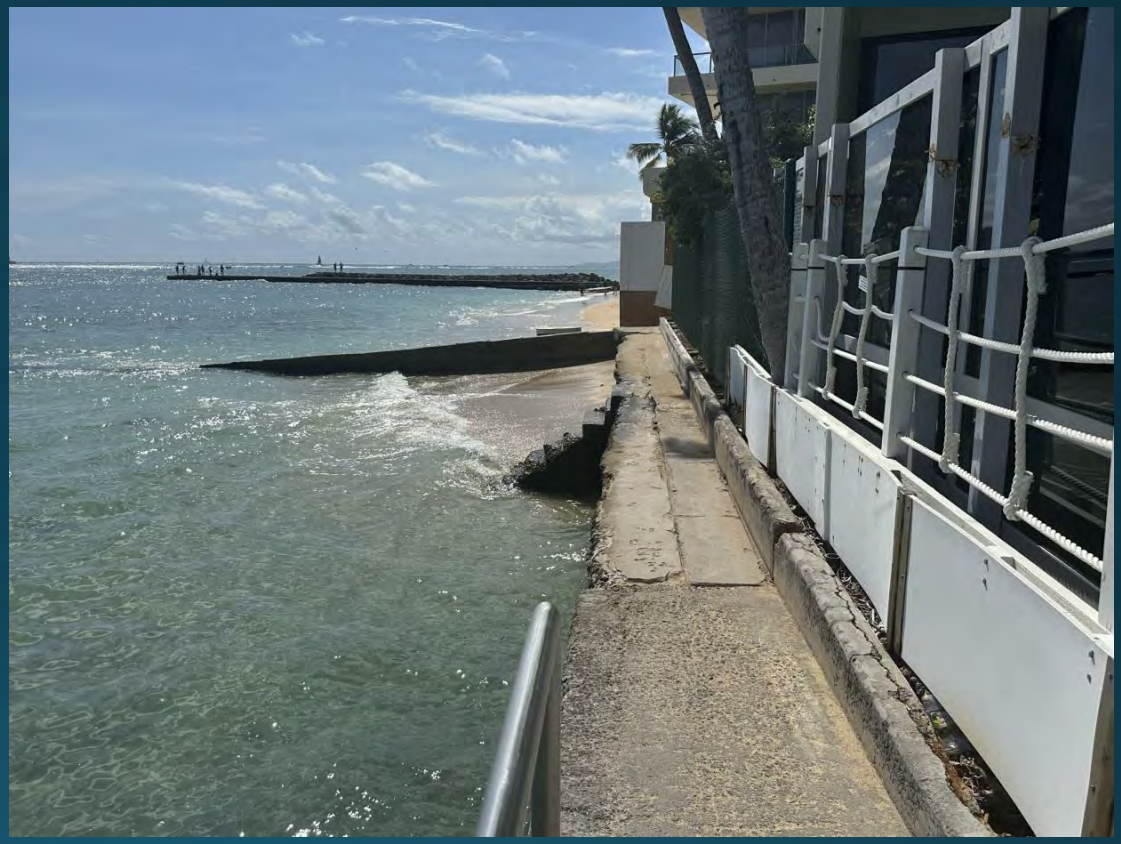
Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Kawehewehe

M: Gray's Beach

There are two small pocket beach between the Sheraton and Halekūlani hotels. The size of the beaches is variable; at times they each run along 100 to 125 feet of shoreline, while at other times they are completely submerged.

N: Walkways II



The walkway fronting the Halekūlani and Outrigger hotels is in a state of disrepair, although it is still frequently used by pedestrians. There are no alternate routes through the hotel properties to reach Fort DeRussy. The first seawalls in Waikīkī were built here in the 1890s and 1900s in response to changing currents and increased erosion, perhaps due to the dredging of the Halekūlani Channel. There are remnants of eight small groins that were once placed here to stabilize the beach.

O: Kawehewehe

The waters of Kawehewehe is a spot for physical and emotional healing for native Hawaiians, and some practitioners still gather limu kālā and practice purification rituals here. Today this beach sector has experienced severe erosion, and in some seasons the waves break against the hotels. The coconut trees that formerly fronted the private properties have been removed, though the stumps remain. Commercial operations occupy the limited beach area.

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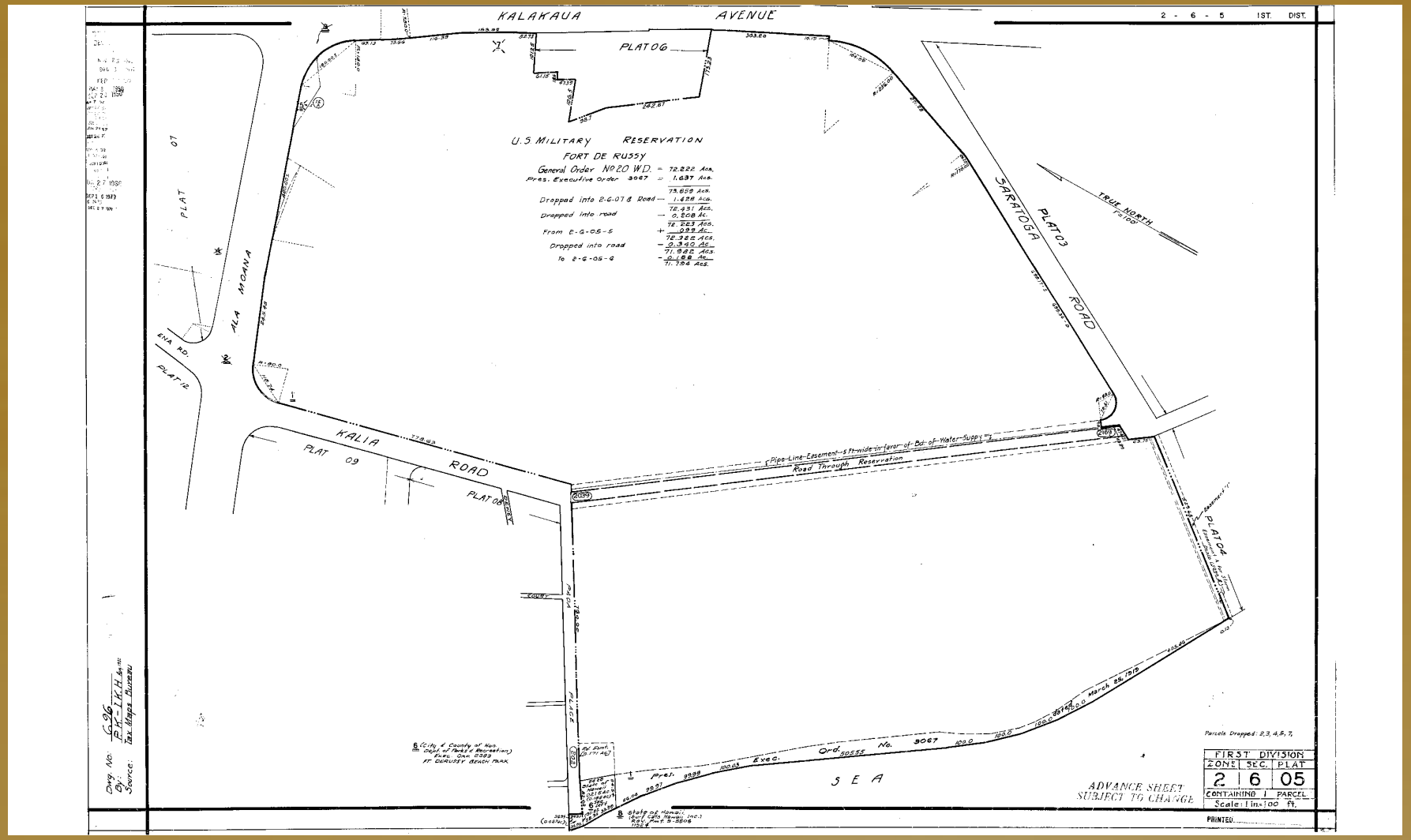

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Fort DeRussy

P: Fort DeRussy

The Diamond Head-side of Fort DeRussy beach has eroded up to the seawall lining the sidewalk, and piles of sand frequently accumulate mauka of the sidewalk after high tides. Commercial activity here occurs closer to the sidewalk than the shoreline. The offshore area was extensively dredged in the 1910s and 1920s to fill in the area's wetlands, and there is still coral rubble in the nearshore waters. The beach fronting the Hale Koa hotel is the widest in Waikīkī.

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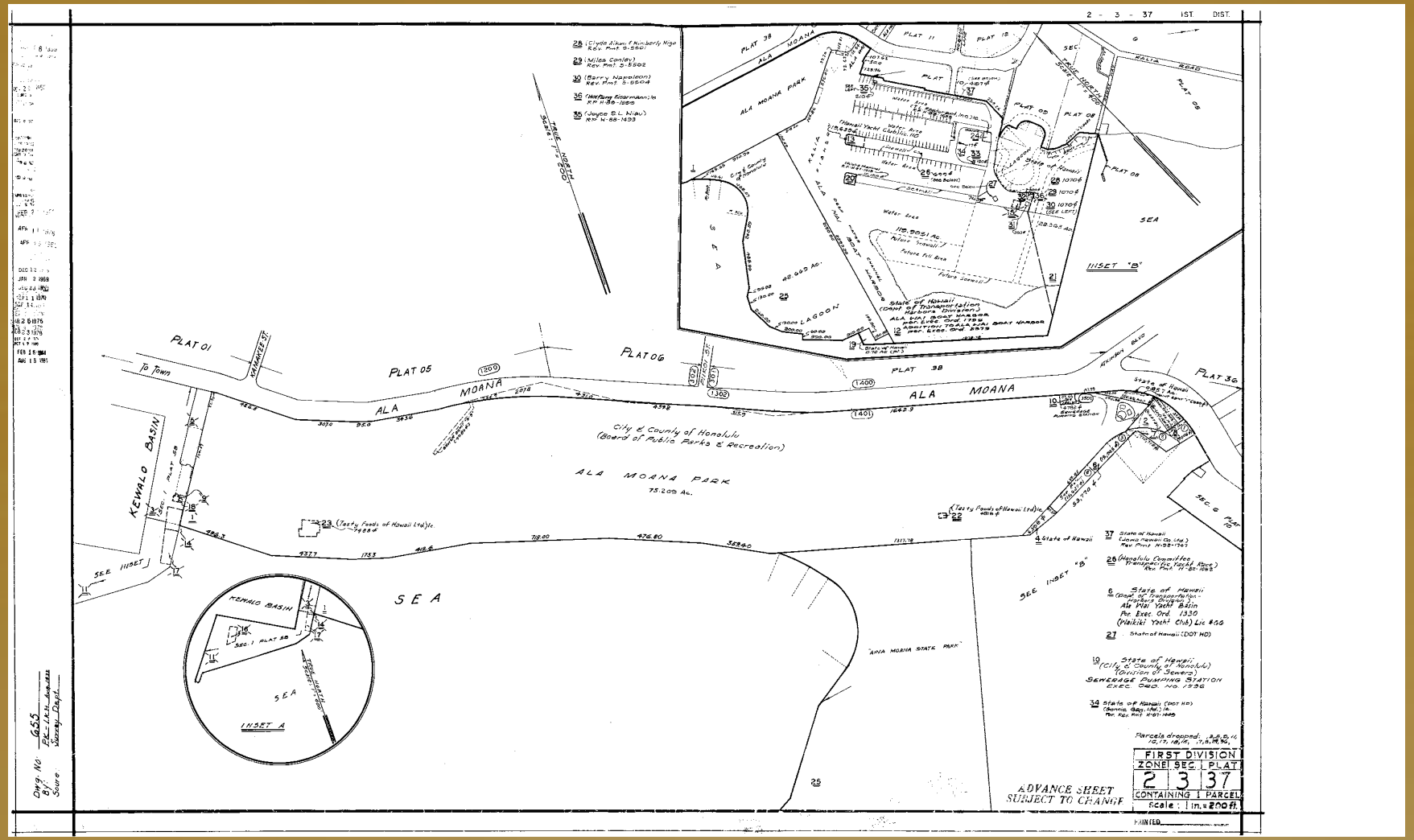

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

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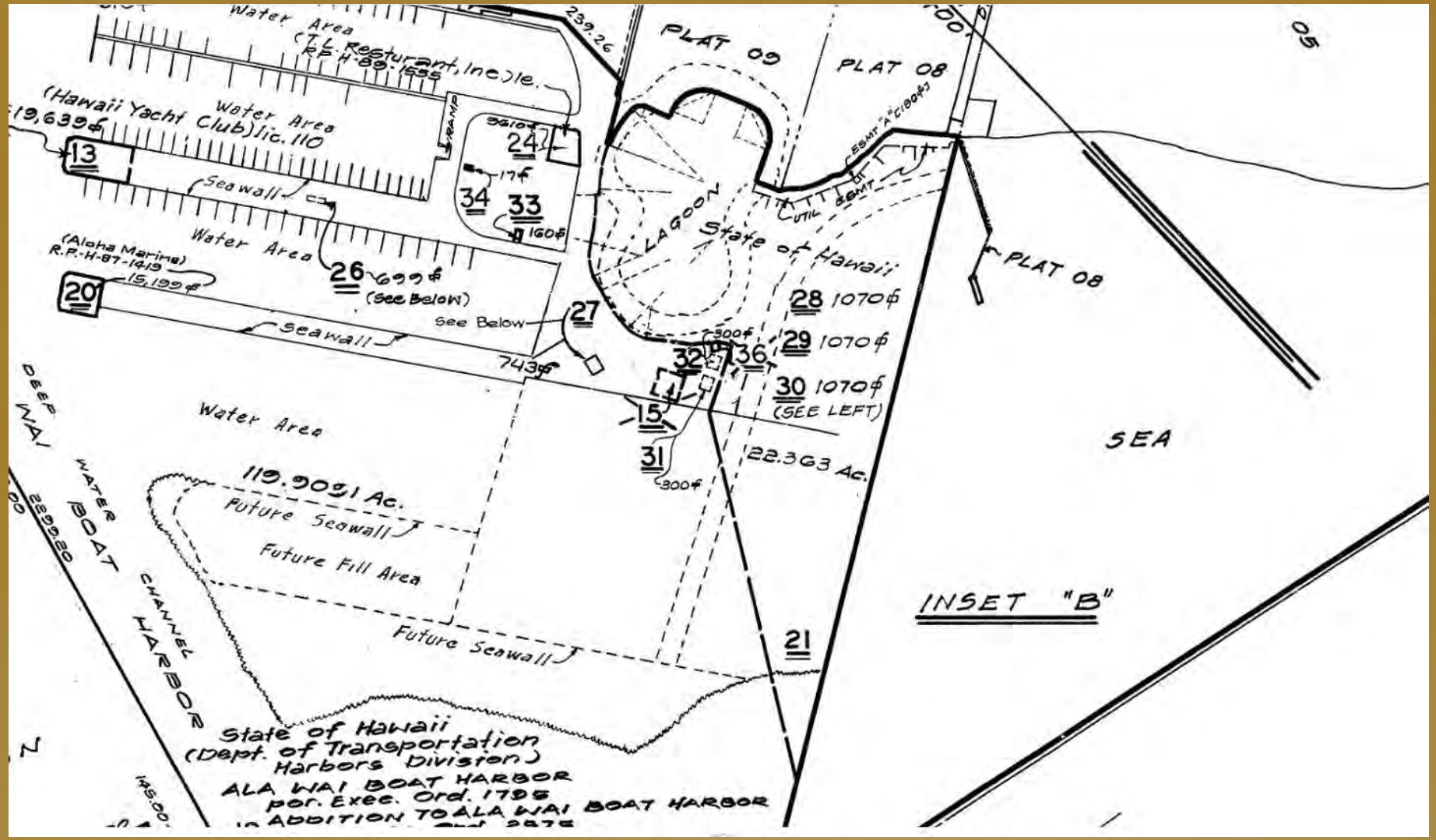

Exhibit 1: Exhibit 1: Waikīkī Virtual Site Visit

Duke Kahanamoku Beach

Q: Duke Kahanamoku Beach

The sand at Duke Kahanamoku is more compact than at other sites. The Molokaʻi Hoe and Nā Wāhine O Kei Kai long-distance canoe races finish here. Breakwaters offshore form a protected swimming area. The inland lagoon was built by Henry Kaiser in 1955 or 1956. It was the subject of a littoral rights exchange with the Territorial government, and is currently owned by the State. Hilton Hawaiian Village retains rights to use and maintain the lagoon.

R: Duke Kahanamoku Beach II

The western-most end of Duke Kahanamoku Beach is not maintained, and is a mix of sand, rock, and coral rubble. The Hilton Hawaiian Village Friday night fireworks are launched from here. This is the home beach of the ʻĀnuenue Canoe Club.

Historic Beach Nourishment Projects in Waikīkī

• 1939	Kūhiō Beach	7,000 yds^3
• 1951-1957	Kūhiō, Queen's Surf, Kapiʻolani	130,000-160,000 yds^3
• 1959	Kūhiō Beach	19,000 yds^3
• 1965	Outrigger Canoe Club	6,000 yds^3
• 1970	Fort DeRussy	82,000 yds^3
• 1972	Kūhiō Beach	12,000 yds^3
• 1975	Fort DeRussy	16,000 yds^3
• 2003	Kūhiō Beach	1,400 yds^3
• 2007	Kūhiō Beach	10,000 yds^3
• 2012	Waikīkī Beach	24,000 yds^3
• 2021	Waikīkī Beach	20,000 yds^3

Conservation District Use Permits

- 1973 CDUP 0450 "Beach restoration work" US Army Corps of Engineers Kapahulu Storm Drain to Elks Club
- 1973 CDUP 0467 "Extension of Ewa groin, redistribution of sand" Division of Land Management & Harbors Division Kūhiō Beach
- 1974 CDUP 0530 "Shore protection and restoration" Division of Land Management & Harbors Division Kūhiō Beach
- 1978 CDUP 1073 "Government facility use" (storm drain) US Army Corps of Engineers Fort DeRussy
- 1983 CDUP 1477 "Kalia Road relief drain project" C&C Department of Public Works Kalia Road
- 2013 CDUP 2013 "Repair of seawall" C&C Department of Parks and Recreation Queen Kapiʻolani Park
- 1997 CDUP 2794 "Hilton Lagoon project" Hilton Hawaiian Village Duke Kahanamoku Lagoon
- 1998 CDUP 2874 "Construction of two groins" C&C Building Department Natatorium
- 2006 CDUP 3297 "Duke Kahanamoku Lagoon restoration project" Hilton Hawaiian Village Duke Kahanamoku Lagoon
- 2010 CDUP 3558 "Waikiki Beach Maintenance Project" Office of Conservation and Coastal Lands Waikīkī Beach
- 2017 CDUP 3784 "Royal Hawaiian Groin improvement project" Department of Land and Natural Resources Royal Hawaiian Groin
- 2020 SSBN OA-19-04 "Kūhiō stub groin and sand backpassing" Office of Conservation and Coastal Lands Kūhiō Beach
- 2021 CDUP 3867 "Waikiki seawall mitigative improvement project" C&C Department of Design and Construction Queen's Surf Beach

Copies of these and other permits can be found at dlnr.hawaii.gov/occl/waikiki

DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Waikīkī Beach Improvement and Maintenance Program

June 2021

Prepared for:
Hawai‘i Department of Land and Natural Resources
Office of Conservation and Coastal Lands
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Partnered with:
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Prepared by:
Sea Engineering, Inc.
Makai Research Pier
41-305 Kalaniana‘ole Hwy
Waimānalo, Hawai‘i 96795

1. EXECUTIVE SUMMARY

Waikīkī is a predominantly engineered shoreline. The beaches of Waikīkī are almost entirely composed of imported sand and the current shoreline configuration is largely the result of past efforts to widen and stabilize the beaches. The beaches of Waikīkī are chronically eroding, and the backshore (landward of the beach) is frequently flooded, particularly during high tide and high surf events. Over the past several years, Hawai'i has experienced record high tides (referred to as *King Tides*) that have exacerbated erosion and flooding in Waikīkī. These events have highlighted the impacts of sea level rise on the beaches of Waikīkī. As sea levels continue to rise, beach loss will progressively degrade the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī.

Almost the entire length of Waikīkī is armored by seawalls, many of which are in various states of disrepair. As the beaches continue to erode and flooding occurs more frequently and extends further landward, processes that are likely to accelerate as sea levels continue to rise, the shoreline will migrate further landward. As the shoreline approaches the existing shoreline armoring, there will be incremental loss of recreational beach area and shoreline habitat, a process that is referred to as *coastal squeeze* (Lester and Matella, 2016). While it is possible that some sand may remain in front of the existing shoreline armoring, what remains of the beaches will be narrow, submerged, unstable, inaccessible, and unusable.

Without beach improvements and maintenance, sea level rise will cause substantial beach loss in Waikīkī. For discussion purposes in this Draft Programmatic Environmental Impact Statement (DPEIS), *beach loss* is defined as the loss of dry recreational beach area and lateral shoreline access during typical wave and tidal conditions.

Beach erosion threatens to diminish the economic viability of Waikīkī. A recent study found that the loss of Waikīkī Beach would result in an annual loss of $2.223 billion in visitor expenditures (Tarui et al. 2018). Beach improvements and maintenance actions are urgently needed to restore and maintain the beaches of Waikīkī to continue to support Hawai'i's tourism-based economy and preserve the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī for future generations.

For discussion purposes in this DPEIS, *beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modifications to existing structures. Beach maintenance options include beach nourishment, sand backpassing, sand pushing, and sand pumping. The proposed beach maintenance actions are intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise. *Beach improvements* refer to actions that involve adding new sand, constructing new structures, and/or modifying existing structures. Beach improvement options include beach nourishment with stabilizing groins, segmented breakwaters, and modifications to existing structures. The proposed beach improvements actions are designed to account for 1.5 ft of sea level rise and may be adapted as sea levels continue to rise.

Exhibit 2: draft EIS Executive Summary

Beach maintenance actions are proposed in three beach sectors of Waikīkī:

- Fort DeRussy Beach Sector – Sand Backpassing
- Royal Hawaiian Beach Sector – Beach Nourishment without Stabilizing Structures
- Kūhiō Beach Sector: Diamond Head (east) Basin – Sand Pumping

Beach improvement actions are proposed in two beach sectors of Waikīkī:

- Halekūlani Beach Sector – Beach Nourishment with Stabilizing Groins
- Kūhiō Beach Sector: ʻEwa (west) Basin – Beach Nourishment with a Segmented Breakwater

The primary objectives of the proposed actions are to:

- Restore and improve Waikīkī's public beaches.
- Increase beach stability through improvement and maintenance of shoreline structures.
- Provide safe access to and along the shoreline.
- Increase resilience to coastal hazards and sea level rise.

The proposed actions were developed in collaboration with public and private stakeholders with the shared goal and vision of making the beaches of Waikīkī sustainable and resilient for current and future generations. Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. The project proponents relied heavily on feedback and direction from local stakeholders to identify issues, needs, priorities, and design criteria for beach sector.

Significant Beneficial Impacts

Improving and maintaining the beaches of Waikīkī will support existing uses and preserve the recreational, social, cultural, environmental, aesthetic, and economic value of Waikīkī. The proposed actions will also decrease vulnerability to coastal hazards, increase resilience to sea level rise, and have a substantial positive impact on the economies of the State of Hawaiʻi and City and County of Honolulu. The proposed actions are consistent with the existing environment and surrounding uses and will not fundamentally alter the character of Waikīkī. The proposed actions will not narrow or curtail the range of beneficial uses in the area.

Potential Adverse Impacts

The proposed actions have the potential to temporarily impact coastal processes, bathymetry, marine habitat and species, water quality, noise, and air quality. The proposed actions also have the potential to temporarily impact commercial operations, shoreline access, ocean recreation, scenic and aesthetic resources, and public services and infrastructure. These impacts are primarily associated with construction activities and are anticipated to be minor and temporary in nature. The potential adverse impacts of the proposed actions are countervailed by the beneficial impacts of preserving and enhancing the recreational, social, cultural, environmental, and aesthetic value of Waikīkī.

Proposed Mitigation Measures

Best Management Practices (BMPs) will be utilized to mitigate or minimize potential impacts to the maximum extent practicable.

Alternatives Considered

A variety of alternatives were evaluated during the project selection and conceptual design process. These alternatives include No Action, Managed Retreat, Repair, Modification, Replacement, or Removal of Existing Structures, Beach Maintenance, and Beach Nourishment With or Without Stabilizing Structures. Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. The project proponents relied heavily on feedback and direction from the Waikīkī Beach Community Advisory Committee (WBCAC) to identify issues, needs, priorities, and design criteria for beach sector.

Unresolved Issues

Project Phasing

The proposed beach maintenance actions are intended to be conducted on a periodic basis and may be adapted as sea levels continue to rise. The proposed beach improvement actions are designed to be implemented in phases, with the initial phase being designed for approximately 1.5 ft of sea level rise, thus in 25 to 30 years following construction it may be necessary to raise the project elevations. If then raised by several feet, the projects could be effective until about the year 2080, or 50-years post-construction. Sea level rise projections continue to evolve as new and improved sea level and climate change research becomes available. It is also important to recognize that global sea level rise will not stop within these timeframes but will very likely continue for centuries. As a result, there is uncertainty regarding precisely when and the degree to which the designs will need to be adapted. As sea levels continue to rise, additional beach improvement and maintenance actions may be required in the other beach sectors of Waikīkī. –

Sand Recovery

The offshore sand deposits that will be used to support the proposed beach improvement actions in the Halekūlani beach sector and Kūhiō beach sector ʻEwa (west) basin have yet to be confirmed. The dredging methods to recovery the offshore sand and transport it to the shoreline for placement have also not been confirmed. These determinations will be made based on feedback obtained during the public review of the DPEIS and will be confirmed during the final design and permitting process.

Costs and Funding

The costs for construction for the proposed beach improvement and maintenance actions has yet to be confirmed. Initial construction costs, recurring maintenance costs, and future adaptation costs will depend on a variety of factors including but not limited to the selected offshore sand deposits, sand recovery and transport methodologies, project phasing, maintenance intervals, the timing and scope of structural adaptations, damage due to unpredictable design wave events (e.g., hurricanes, tsunamis), and inflation/deflation over the life of the program.

Monitoring

The monitoring and assessment plans for the proposed actions include beach profile monitoring, water quality monitoring, and marine biological monitoring (see Chapter 12). At this time, it is unclear if any additional monitoring will be required. Monitoring requirements will be confirmed during the final design and permitting process.

Required Permits and Approvals

Due to recent statutory changes and ongoing policy changes, there is uncertainty in terms of the permits and approvals that will be required for the proposed actions. Regulatory requirements will be confirmed during the final design and permitting process.

Existing Structures

The proposed actions were developed as mandated in Governor David Ige's August 2018 directive to include a sea level rise analysis in Environmental Impact Statements. The proposed actions will be located primarily on submerged lands makai (seaward) of the shoreline; however, some aspects of the proposed actions (e.g., laydown and staging areas) may extend mauka (landward) of the shoreline. The existing seawalls that span nearly the entire length of the Waikīkī shoreline are privately-owned structures and are located outside of the Conservation District. During the final design phase, it may be determined that the existing seawalls may need to be modified to accommodate increased beach elevation. The seawalls may also need to be modified or replaced to accommodate a beach walkway in the Halekūlani beach sector. The seawalls are privately-owned structures and are located outside of the Conservation District. The DLNR does not regulate land uses mauka (landward) of the shoreline.

Compatibility with Existing Land Use Plans and Policies

The proposed actions are compatible with the following land use plans and policies:

- Coastal Zone Management Act of 1972 (16 USC §§1451-1464)
- Hawaiʻi Administration Rules §13-5 Conservation District
- Hawaiʻi State Plan (Hawaiʻi Revised Statutes Chapter 226)
- Conservation Lands State Functional Plan (1991)
- Recreation State Functional Plan (1991)
- Hawaiʻi State Tourism Function Plan (1991)
- General Plan for the City and County of Honolulu
- Primary Urban Center Development Plan
- Oʻahu Resilience Strategy
- Chapter 23, Revised Ordinances of Honolulu (Shoreline Setbacks)
- Chapter 25, Revised Ordinances of Honolulu (Special Management Area)

Required Permits and Approvals

The primary Federal approvals required for the proposed actions are:

- Section 10, Rivers and Harbors Act (U.S. Army Corps of Engineers)
- Section 404, Clean Water Act (U.S. Army Corps of Engineers)

Other Federal laws that may affect the proposed actions include:

- Archaeological and Historic Preservation Act (16 USC § 469a-1)
- National Historic Preservation Act of 1966 (16 USC § 470(f))
- Native American Graves Protection and Repatriation Act of 1990 (25 USC § 3001)
- Clean Air Act (42 USC § 7506(C))
- Coastal Zone Management Act (16 USC § 1456(C) (1))
- Endangered Species Act (16 U.S.C. 1536(A) (2) and (4))
- Fish and Wildlife Coordination Act of 1934, as amended (16 USC §§ 661-666[C] et seq.)
- Magnuson-Stevens Fishery Conservation and Management Act (16 USC § 1801 et seq.)

- Marine Mammal Protection Act of 1972, as amended (16 USC §§ 1361-1421(H) et seq.)
- EO 13089, Coral Reef Protection (63 FR 32701)
- Migratory Bird Treaty Act of 1918, as amended (16 USC §§ 703-712)

The primary State of Hawai‘i approvals required for the proposed actions are:

- Conservation District Use Permit – Hawai‘i Department of Land and Natural Resources
- Small-scale Beach Nourishment Permit – Hawai‘i Department of Land and Natural Resources
- Small-scale Beach Restoration Permit – Hawai‘i Department of Land and Natural Resources
- Shoreline Certification – Hawai‘i Department of Land and Natural Resources
- Right of Entry Permit – Hawai‘i Department of Land and Natural Resources
- Section 401 Water Quality Certification – Hawai‘i Department of Health
- National Pollutant Discharge Elimination System – Hawai‘i Department of Health
- Community Noise Permit – Hawai‘i Department of Health
- Coastal Zone Management Consistency Review – Hawai‘i Department of Business, Economic Development, and Tourism, Office of Planning

The primary City and County of Honolulu approvals required for the proposed actions are:

- Special Management Area Permit
- Shoreline Setback Variance
- Grubbing, Grading and Stockpiling Permit
- Building Permit

Relevant EAs and EISs Considered in the Analysis of the Preparation of the DPEIS.

- *Environmental Assessment for Fort DeRussy Beach Restoration*: *Waikīkī, O‘ahu, Hawai‘i.* Prepared by United States Army Corps of Engineers, Honolulu District. (December 1993).
- *Environmental Assessment/Environmental Impact Statement Preparation Notice for Gray’s Beach Restoration Project*: *Waikīkī, O‘ahu, Hawai‘i.* Prepared by Planning Solutions and Sea Engineering, Inc. (August 2008).
- *Final Environmental Assessment for Waikīkī Beach Maintenance*: *Waikīkī, O‘ahu, Hawai‘i.* Prepared by Sea Engineering, Inc. (June 2010).
- *Final Environmental Assessment for Iroquois Point Beach Nourishment and Stabilization: ‘Ewa Beach, O‘ahu, Hawai‘i.* Prepared by Sea Engineering, Inc. (January 2012).
- *Final Environmental Assessment for Royal Hawaiian Groin Replacement Project*: *Waikīkī, O‘ahu, Hawai‘i.* Prepared by Sea Engineering, Inc. (May 2016).
- *Draft Environmental Assessment for Waikīkī (Queen’s Surf) Seawall Mitigative Improvements*: *Waikīkī, O‘ahu, Hawai‘i.* Prepared by Oceanit, Inc. (June 2017).
- *Final Environmental Impact Statement for Ala Moana Regional Park and Magic Island Improvements*: *Honolulu, O‘ahu, Hawai‘i.* Prepared by Belt Collins. (June 2018).
- *Final Environmental Impact Statement for the Waikīkī War Memorial Complex*: *Waikīkī, O‘ahu, Hawai‘i.* Prepared by AECOM Technical Services, Inc. (October 2019).
- *Draft Environmental Impact Statement for Kā‘anapali Beach Restoration and Berm Enhancement.* Prepared by Sea Engineering, Inc. (August 2020).

2. INTRODUCTION

2.1 Project Area Description

Waikīkī Beach extends along the shoreline of Mamala Bay on the south shore of the island of Oʻahu, Hawaiʻi (Figure 2-1 and Figure 2-2). The Waikīkī shoreline originally consisted of a narrow barrier beach backed by wetlands, duck ponds, taro farms, and fishponds. In the late 1800s, the first tourist attractions were established in Waikīkī. Development of beachfront hotels such as the Sans Souci, Moana Surfrider, and Honolulu Seaside soon followed.

In 1881, Long Branch Baths bathhouse was built on the beach at the water's edge, near the present-day Moana Surfrider Hotel (Wiegel, 2008). The bathhouse serviced visitors by providing changing rooms, towels, swimsuits, and access to the beach, all for a fee, which caught the attention of Waikīkī businessmen and developers (Miller and Fletcher, 2003).

In 1890, a seawall was constructed to protect Waikīkī Road (now Kalākaua Avenue) at the entrance to Kapiʻolani Park. In 1901, the Moana Hotel (now Moana Surfrider Hotel) opened with a restaurant on piles over the beach and water (Wiegel, 2008; Cohen, 2000). Seawalls rapidly proliferated and their adverse impacts on the sandy shoreline were immediately apparent.

In the early 1900s, the wetland areas were declared a public health hazard, and the government decided to dredge the Ala Wai Canal to drain the wetlands and use the dredge material to fill in the low-lying areas (Miller and Fletcher, 2003). In the early 1900s, much of the beach at Waikīkī disappeared under structures and landscaping, and significant volumes of sand were reportedly removed from the beach and adjacent backshore area (Wiegel, 2008). In later years, sand was imported into Waikīkī to increase beach width, and numerous shore perpendicular and shore parallel channels were dredged in the reef for navigation, ocean recreation, and fill material to increase the width of the historically narrow beaches.

In 1917, the Hawaiʻi Board of Harbor Commissioners prohibited construction of seawalls along the shoreline; however, the prohibition was widely ignored. A total of 37 seawalls were constructed in Waikīkī, and by about 1920 seawalls lined most of Waikīkī Beach (Crane, 1972; Miller and Fletcher, 2003; Wiegel, 2008).

A 1926 investigation of Waikīkī Beach by the Engineering Association of Hawaiʻi concluded that seawalls were the primary cause of beach erosion and that beach nourishment and groins could be used to rebuild the beach (Gerritsen, 1978; Miller and Fletcher, 2003). A total of 42 groins or groin-like structures have been constructed in Waikīkī. Only the larger groins have been effective in stabilizing the beach. Most of the smaller groins are deteriorated or have been removed (Crane, 1972). 8 groins remain functional today. These groins compartmentalize the beaches of Waikīkī into discrete sectors that are similar to littoral cells (see Section 2.5).

In 1928, the Waikīkī Beach Reclamation agreement was established between the Territory of Hawaiʻi and various property owners in Waikīkī. The agreement recognized the need to control and limit seaward development on Waikīkī Beach and established limitations on construction along the beach in response to the proliferation of seawalls and groins in Waikīkī. The agreement provided that the Territory of Hawaiʻi would build a beach seaward from the existing high water mark and that title of the newly created beach would be vested by the abutting

landowners. The Territory of Hawaiʻi and private landowners further agreed that no new structures would be built on the beach in Waikīkī. The private landowners agreed to provide a 75-ft-wide public easement along the beach inshore of the new mean high water mark.

The 1928 agreement covers the Waikīkī beach area from the Ala Wai Canal to the Elks Club at Diamond Head. The 1928 agreement consists of a) the October 19, 1928 main agreement between the Territory and Waikīkī landowners, b) the October 19, 1928 main agreement between the Territory and the Estate of Bernice Pauahi Bishop, and c) the July 5, 1929 Supplemental Agreement between the Territory and Waikīkī landowners. The area between the Royal Hawaiian Hotel and the Moana Surfrider Hotel is the subject of a separate agreement between the State of Hawaiʻi and the subject Waikīkī landowners established on May 28, 1965.

From about 1930 until the late 1970s, it is estimated that over 400,000 cy of sand was placed on Waikīkī Beach, from a variety of sources including other beaches on Oʻahu and Molokaʻi, backshore dune deposits, and crushed coralline limestone. Between 1925 and 2001, the Waikīkī shoreline moved about 40 ft seaward, reflecting the extensive human alteration of the shoreline (Miller and Fletcher, 2003). Despite past beach nourishment efforts, Miller and Fletcher (2003) estimate that, between 1951 and 2001, at least 100,000 cy of sand has been lost to erosion.

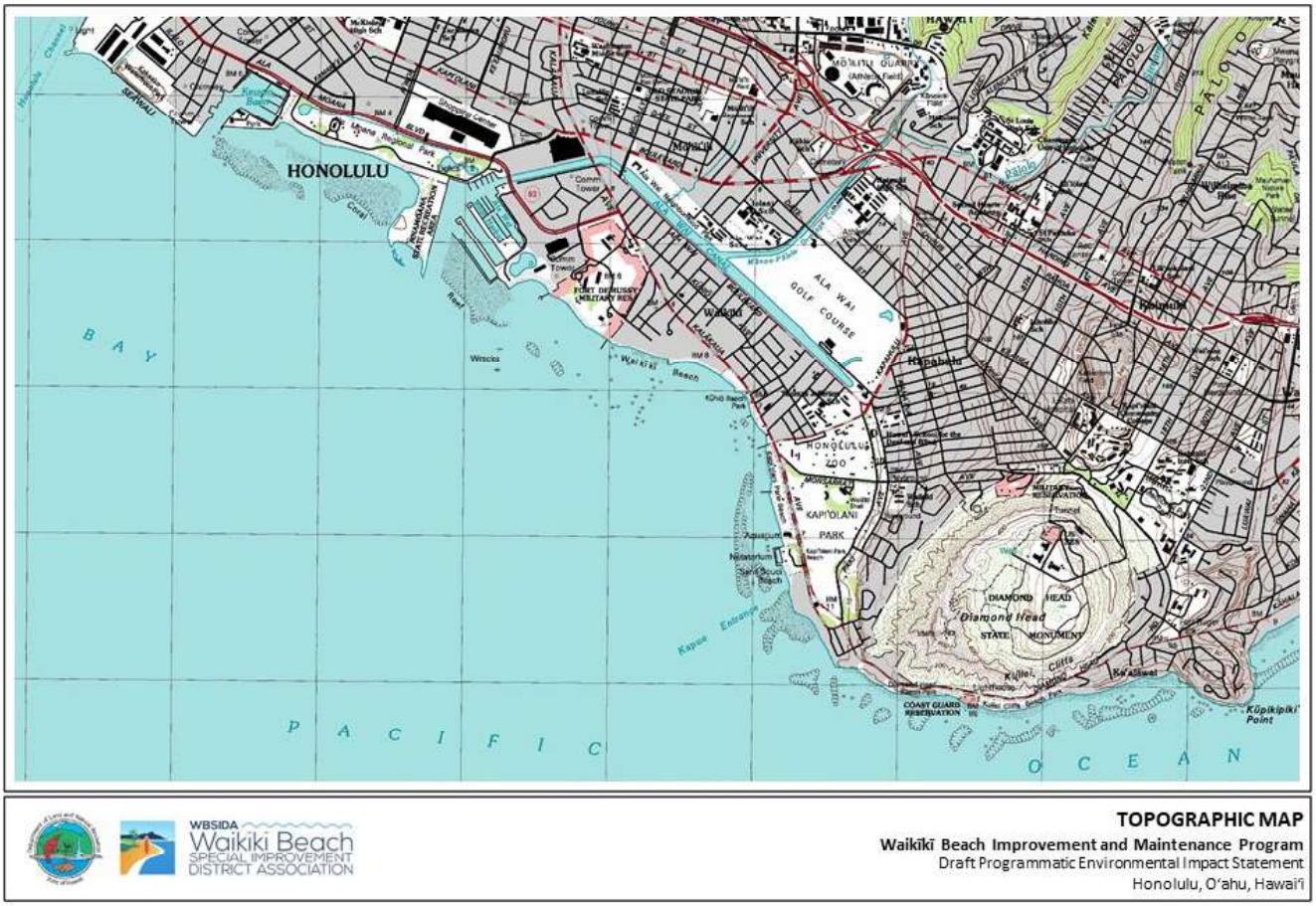

Figure 2-1 Topographic map of Waikīkī (USGS)

Exhibit 2: draft EIS Introduction

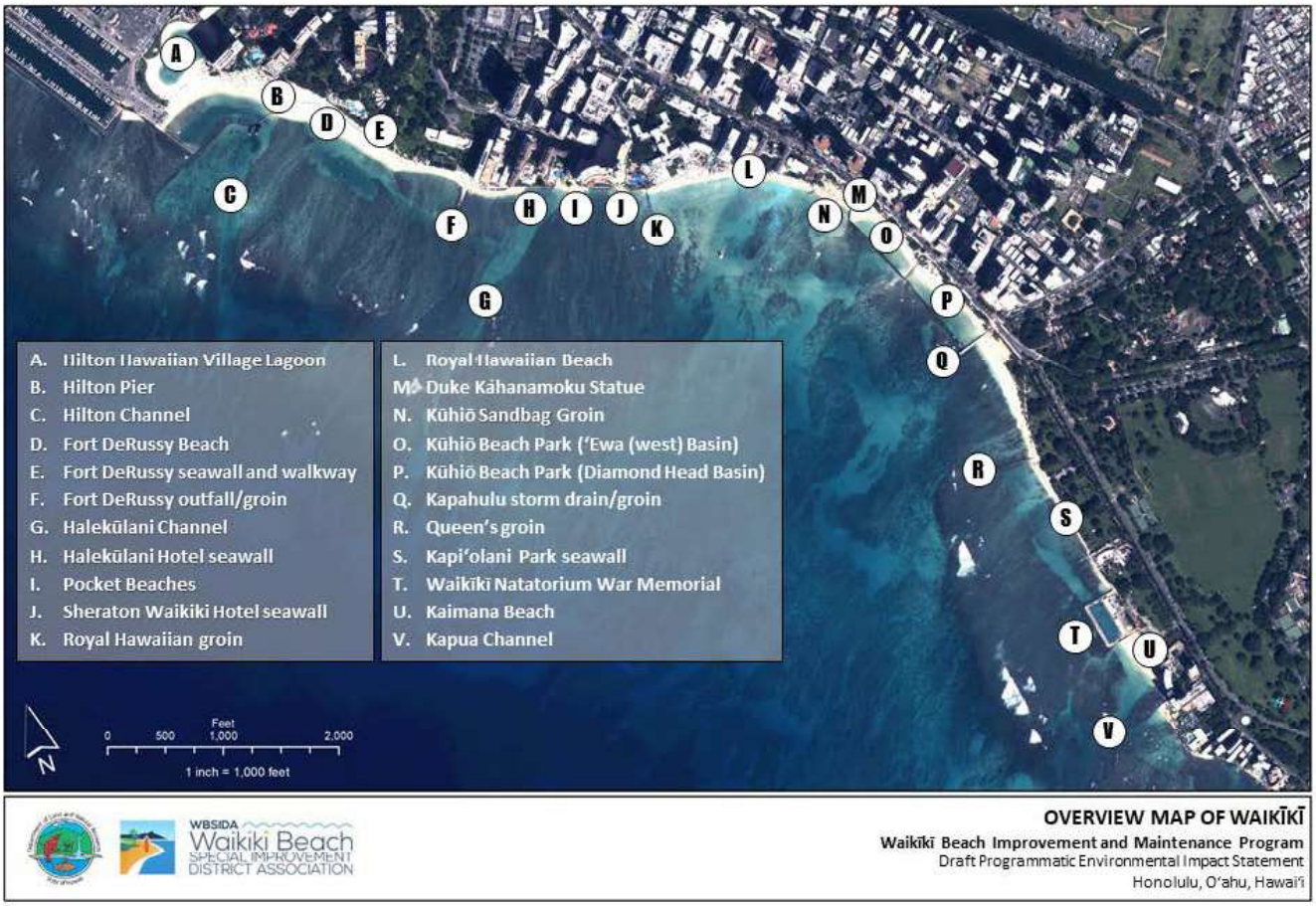

Figure 2-2 Overview map of Waikīkī

2.2 Purpose and Need for the Program

Waikīkī is a predominantly engineered shoreline. Almost the entire length of Waikīkī is armored by seawalls that were constructed in the early 1900s, many of which are in various states of disrepair. The beaches of Waikīkī are primarily man-made and composed almost entirely of sand that has been imported from various terrestrial sources, other beaches, and dredged from offshore deposits. Beach stability is largely dependent on the presence of numerous groins, breakwaters, and other structures that stabilize the sand along the shoreline.

Waikīkī is recognized as Hawaii's primary visitor destination and is home to more than 30,000 visitor accommodation units including resorts, hotels, and condominiums, which accounts for 90% of all units on Oʻahu and nearly half of all units in the State of Hawaiʻi (HTA, 2018). In 2002, tourism-related activities in Waikīkī accounted for an estimated $3.6 billion, which was 8% of Hawaii's Gross State Product. In addition, 12% of all State and County tax revenues and 10% of all civilian jobs statewide can be credited to Waikīkī's attraction of visitors (DBEDT, 2003). In 2015, Waikīkī generated 41% of the state's visitor industry activity and contributed 7% to Hawaii's Gross State Product (State of Hawaiʻi, 2015; Porro, 2020).

The beaches of Waikīkī have tremendous historical, cultural, and recreational value and are the primary amenity that supports the tourism-based economies of Waikīkī, the City and County of Honolulu, and the State of Hawaiʻi. Hospitality Advisors LLC (2008) found that more than 90% of visitors considered beach availability in Waikīkī as very important or somewhat important.

Erosion is a serious threat to beach-related tourism and public shoreline access (USACE, 1994). Beach loss results in a variety of negative economic, social, cultural, environmental, recreational, and aesthetic impacts. These impacts highlight the need for sustained long-term capital improvements and comprehensive beach management to sustain the unique qualities and values of Waikīkī Beach. Many of Hawaii's sandy beaches are suffering from erosion. Fletcher et al. (2012) found that 70% of beaches in Hawaiʻi are undergoing chronic (long-term) erosion and over 10% (13 miles) of Hawaii's beaches have been completely lost to erosion over the past century. The Island of Oʻahu has 66.5 miles of sandy beaches, approximately 60% of which are experiencing erosion (Fletcher et al. 2011).

Sea level rise has emerged as a serious threat to the beaches of Waikīkī. The earth is experiencing climatic changes that are unprecedented in modern history. The earth and oceans are rapidly warming, and one inexorable result of this is an accelerating rise in global mean sea level as seawater expands and as glaciers and ice sheets melt. Vousdoukas et al. (2020) found that a substantial proportion of the world's sandy coastlines are eroding, and that sea level rise could result in the near extinction of 35.7 to 49.5% of the world's sandy beaches by the end of the century. Hawaiʻi is uniquely vulnerable to sea level rise due to a combination of our geography, topography, wave climate, and coastal development patterns. Erosion and beach loss in Hawaiʻi are expected to increase significantly as rates of sea level rise increase. Anderson et al. (2015) found that, due to sea level rise, the average shoreline recession in Hawaiʻi by 2050 is projected to be nearly twice the historical rates, and nearly 2.5 times the historical rates by 2100.

The *Hawai'i Sea Level Rise Vulnerability and Adaptation Report* (2017) found that 3.2 ft of sea level rise will have profound impacts on Oʻahu. $12.9 billion in structures and land could be lost; 3,800 structures could be flooded, including hotels and resorts in Waikīkī; over 13,000 residents could be displaced; and nearly 18 miles of major roads could be flooded. The 2017 report estimates that, due to the density of development and economic assets, Oʻahu will account for an estimated 66% of the total statewide economic losses due to sea level rise. The State of Hawai'i recommended that private and public entities in Waikīkī should begin planning for sea level rise adaptation, including beach restoration, to prepare for higher sea levels in the future.

The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. The beaches of Waikīkī are critical infrastructure and the primary amenity that has established Waikīkī as a world-class tourism destination. Complete erosion of Waikīkī Beach would result in an annual loss of $2.223 billion in visitor expenditures (Tarui et al. 2018). Despite being such a critical component of Hawaii's tourism-based economy, relatively little has been spent on improving and maintaining the beaches of Waikīkī. From 2006 to 2021, approximately $10 million dollars has been invested in beach improvement projects in Waikīkī. In 2019, the Hawai'i State Legislature appropriated $8.85 million to support beach improvement and maintenance projects in Waikīkī with up to $3 million of this support provided by the Waikīkī Beach Special Improvement Distract Association (WBSIDA).

The Oʻahu Resilience Strategy prepared by the City and County of Honolulu Office of Climate Change, Sustainability and Resiliency (2019) defines resilience as "the ability to survive, adapt and thrive regardless of what shocks or stresses come our way." Healthy, stable beaches provide a first line of defense against coastal flooding and inundation by rising sea levels and hurricane storm waves. Beach improvements are necessary to ensure that the beaches and economy of Waikīkī are sustainable and resilient to sea level rise. The proposed actions directly support the recommendations and goals of the State of Hawai'i and City and County of Honolulu to increase resilience to sea level rise.

2.3 Objectives of the Proposed Actions

The beaches of Waikīkī are chronically eroding, and the backshore is frequently flooded, particularly during high tides and high surf events. The loss of Waikīkī Beach would result in a loss of $2.223 billion in in visitor expenditures (Tarui et al. 2018). Improvements and maintenance are necessary to restore and maintain the beaches of Waikīkī to continue to support Hawaii's tourism-based economy and preserve the recreational, social, cultural, environmental, and aesthetic value of Waikīkī for future generations.

For discussion purposes in this DPEIS, *beach maintenance* refers to actions that involve using existing sand or adding sand with no new structures or modifications to existing structures. Beach maintenance options include beach nourishment, sand backpassing, sand pushing, and sand pumping. *Beach improvements* refer to actions that involve adding new sand, constructing new structures, and/or modifying existing structures. Beach improvement options include beach nourishment with stabilizing groins, segmented breakwaters, and modifications to existing structures.

Beach maintenance actions are proposed in three beach sectors of Waikīkī:

- Fort DeRussy Beach Sector – Sand Backpassing
- Royal Hawaiian Beach Sector – Beach Nourishment without Stabilizing Structures
- Kūhiō Beach Sector: Diamond Head (east) Basin – Sand Pumping

The proposed beach maintenance actions are being intended to be implemented periodically on an as-needed basis. Beach maintenance would be conducted when beach conditions reach some pre-defined topographic triggers. Beach monitoring would be required to determine when the triggers have been met. The proposed beach maintenance actions are not designed to account for sea level rise.

Beach improvement actions are proposed in two beach sectors of Waikīkī:

- Halekūlani Beach Sector – Beach Nourishment with Stabilizing Groins
- Kūhiō Beach Sector: ʻEwa (west) Basin – Beach Nourishment with a Segmented Breakwater

The proposed beach improvement actions are designed to be implemented in phases, with the initial phase being designed for approximately 1.5 ft of sea level rise, thus in 25 to 30 years following construction it may be necessary to raise the project elevations. If then raised by several feet, the projects could be effective until about the year 2080, or 50-years post-construction. It is important to note that sea level rise projections continue to evolve as new and improved sea level and climate change research becomes available. It is also important to recognize that global sea level rise will not stop within these timeframes but will very likely continue for centuries.

The primary objectives of the proposed beach improvement and maintenance actions are to:

- Restore and improve the beaches of Waikīkī.
- Increase beach stability through improvement and maintenance of shoreline structures.
- Provide safe access to and along the shoreline.
- Increase resilience to coastal hazards and sea level rise.

2.4 Project Stakeholders and Proponents

The actions proposed for implementation in Waikīkī will be undertaken by the State of Hawai'i Department of Land and Natural Resources (DLNR), which is responsible for overseeing beaches and submerged lands out to the seaward extent of the State's jurisdiction. The proposed actions were developed in collaboration with public and private stakeholders with the shared goal and vision of improving the beaches of Waikīkī for current and future generations.

Project coordination and implementation is being done in collaboration with the Waikīkī Beach Special Improvement District Association (WBSIDA), which is a private non-profit organization that was created in 2015 by City ordinance to preserve and restore Waikīkī Beach, and to serve as a cost-share partner in a public-private partnership with the DLNR. The WBSIDA is governed by a Board of Directors that consists of representatives of Waikīkī's major resorts, property owners, State and County government designees, and other stakeholders. The WBSIDA provides a mechanism for coordination of the proposed actions with a broad spectrum of Waikīkī stakeholders and securing private funding to support project implementation.

The proposed actions were developed in close collaboration with the Waikīkī Beach Community Advisory Committee (WBCAC), which was formed in 2017 to provide a forum to engage stakeholders and provide guidance and feedback on design criteria and rationale for beach improvement and maintenance projects in Waikīkī. The WBCAC is composed of various stakeholders representing business (34%), government (30%), hotels and resorts (15%), non-profit organizations (12%), and science and engineering (9%). The WBCAC serves as a representative body to communicate the diversity of perspectives and priorities in the broader Waikīkī community, provide guidance and feedback for beach management and planning activities in Waikīkī, and ensure that future beach management projects address the issues and concerns of the Waikīkī community and local stakeholders.

The WBCAC has and continues to serve a vital role in the planning process that led to the selection of the proposed actions. The WBCAC was directly involved in determining the priorities and objectives for each beach sector, establishing planning and design criteria, evaluating conceptual options, and providing feedback on the conceptual designs for the proposed actions. The function of the WBCAC is further enhanced by the role of the University of Hawai'i Sea Grant Program's Waikīkī Beach Management Coordinator, which provides technical support, education and outreach, and project coordination. The WBCAC held six (6) formal meetings from 2017 to 2021. The meeting agendas and outcomes are included as Appendix A. The WBCAC will continue to provide feedback on the proposed actions throughout the environmental review, final design, and permitting processes.

2.5 Waikīkī Beach Sectors

Waikīkī is a predominantly engineered shoreline, and the beach is almost entirely composed of imported sand. Almost the entire length of Waikīkī is armored by seawalls, many of which are in various states of disrepair. The beaches of Waikīkī are primarily man-made and are largely dependent upon the presence of groins that stabilize the sand. The groins compartmentalize the Waikīkī shoreline into discrete units that are semi-contained with limited sediment transport

between adjacent sectors. For the purposes of this DPEIS, the Waikīkī shoreline is divided into eight discrete *beach sectors* that have unique physical characteristics.

The *beach sectors* are similar to *littoral cells*, which are defined as coastal compartments that contain a complete cycle of sedimentation including sources, transport paths, and sinks (Inman, 2005). The cell boundaries delineate the geographical area within which the budget of sediment is balanced, providing the framework for the quantitative analysis of coastal erosion and accretion. The sediment sources are commonly streams, sea cliff erosion, onshore migration of sand banks, and material of biological origin such as shells, coral fragments, and skeletons of small marine organisms".

The natural shoreline of Waikīkī pre-development consisted of combination of pocket beaches, streams, and wetlands. It is possible that Mamala Bay was originally a single littoral cell, bounded on the east by Diamond Head, and on the west by Kalaeloa (Barbers Point). The shoreline of Waikīkī has been engineered and significantly modified over the past century, when streams were diverted, wetlands were filled, shoreline structures (e.g., seawalls, storm drains, groins, and breakwaters) were constructed, and sand beaches were built. The present-day shoreline of Waikīkī is compartmentalized by engineered structures, many of which were constructed with the specific intent of stabilizing the beaches. For the purposes of this DPEIS, these compartments are referred to as *beach sectors*. The beach sectors are shown in Figure 2-3 and summarized below (from west to east).

- ***Duke Kahanamoku (Hilton) Beach*** consists of approximately, 1,100 ft of shoreline extending from a rubblemound breakwater to the Hilton pier/groin.

- ***Fort DeRussy Beach*** consists of approximately, 1,680 ft of shoreline extending from the Hilton pier/groin to the Fort DeRussy outfall/groin.

- ***Halekūlani Beach*** consists of approximately 1,450 ft of shoreline extending from the Fort DeRussy outfall/groin to the Royal Hawaiian groin.

- ***Royal Hawaiian Beach*** consists of approximately 1,730 ft of shoreline extending from the Royal Hawaiian groin to the 'Ewa (west) groin at Kūhiō Beach Park

- ***Kūhiō Beach*** consists of approximately 1,500 ft of shoreline extending from the 'Ewa (west) groin at Kūhiō Beach Park to the Kapahulu storm drain/groin.

- ***Queen's Beach*** consists of approximately 1,050 ft of shoreline extending from the Kapahulu storm drain/groin to the Queen's Surf groin.

- ***Kapi'olani Beach*** consists of approximately 1,250 ft of shoreline extending from the Queen's Surf groin to the north wall of the Waikīkī Natatorium War Memorial.

- ***Kaimana (Sans Souci) Beach*** consists of approximately 500 ft of shoreline extending from the north wall of the Waikīkī Natatorium War Memorial to the groin fronting the New Otani (Kaimana) Hotel.

The relative independence of the beach sectors allows for improvements to be made incrementally, rather than all at once. This will allow for prioritization, funding, final design, permitting, and construction to be phased over time, while limiting impacts to one sector at a time.

2.6 Sectors Selected for Beach Improvement and Maintenance Actions

Selection of the proposed beach improvement and maintenance actions was a primarily stakeholder-driven process. The project proponents relied heavily on feedback and direction from the WBCAC to identify issues, needs, priorities, and design criteria for beach sector. Four beach sectors were identified as being the highest priorities for beach improvements and maintenance (Figure 2-4): Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō.

While the other beach sectors of Waikīkī – Duke Kahanamoku, Queens, Kapiʻolani, and Kaimana - were not selected for beach improvement and maintenance actions, these areas are clearly important and, as sea levels continue to rise, additional actions may be necessary in these beach sectors in the future. For additional information about the WBCAC and the project selection process, see Appendix A.

The proposed actions are intended to compliment recent efforts to improve the condition and stability of the beaches in Waikīkī including:

- Waikīkī Beach Maintenance I (completed May 2012)
- Waikīkī Beach Management Plan (completed May 2018)
- Kūhiō Sandbag Groin (completed November 2019)
- Royal Hawaiian Groin Replacement (completed August 2020)
- Waikīkī Beach Maintenance II (completed May 2021)

Waikīkī Beach Maintenance I

In 2012, the DLNR conducted the Waikīkī Beach Maintenance I project. Approximately 24,000 cy of sand was dredged from an offshore sand deposit near the *Canoes* and *Queens* surf breaks. Sand recovery was accomplished with the use of a Toyo DB 75B 8-inch pump with ring jet attachment suspended from an 80-ton capacity crawler crane on a barge. The average rate of sand recovery was approximately 500 cy per day. The sand discharge pipeline was an 8-inch high-density polyethylene (HDPE) pipe with a total length of 3,200 ft. Sand was pumped into a dewatering basin that was constructed in the Diamond Head (east) basin of Kūhiō Beach Park. The dewatering basin measured approximately 100 ft wide and 400 ft long. Sand was pushed into large piles with an excavator and bulldozer and then transported by dump trucks to the sand placement area on Royal Hawaiian Beach. The project widened the beach by an average of 37 ft, which aligned with the position of the shoreline in 1985. The project was completed in June 2012 (Figure 2-5 and Figure 2-6). The permits included a second nourishment effort approximately 10 years after the initial nourishment.

Beach monitoring following the 2012 Waikīkī Beach Maintenance I project showed continued erosion and beach recession at the east and west ends of the Royal Hawaiian beach sector. Habel (2016) found that beach recession ranged from 5.2 to 9.5 ft/yr at the east end fronting the beach concessions. This erosion exposed the old concrete foundation of the Waikīkī Tavern, creating a hazardous condition for beach users, and has resulted in damage and flanking of the Kūhiō

Beach 'Ewa (west) groin. In January 2018, the City and County of Honolulu funded construction of a temporary erosion control structure built of sand-filled geotextile mattresses to cover the tavern foundation and prevent erosion of terrigenous sediment from the backshore.

Waikīkī Beach Management Plan

The WBSIDA provides a unique opportunity for public-private partnerships to support policy, planning, research and scientific studies in Waikīkī Beach and the Ala Wai Canal. The WBSIDA has provided leadership, coordination and cost sharing that has improved the ability of State and local stakeholders to secure funding for beach improvement and maintenance projects in Waikīkī. The WBSIDA has also taken a lead role in facilitating, coordinating, and supporting beach improvement projects in Waikīkī.

The WBSIDA, in partnership with the University of Hawai'i Sea Grant Program, has developed the Waikīkī Beach Management Plan, which provides a management framework and strategies to ensure that prioritized beach improvement and maintenance projects are consistent with vision, goals, and expectations of the broader Waikīkī community. The primary goal of the plan is to improve the quality, sustainability, and stability of the public beaches and nearshore resources in Waikīkī. The Waikīkī Beach Management Plan is part of a broader environmental initiative, *Ho'omau 'O Waikīkī Kahakai*, which serves as a guiding principle for the community visioning process for beach management, improvement, and maintenance projects in Waikīkī.

The Waikīkī Beach Management Plan was completed in May 2018, approved by the WBSIDA Board of Directors and the Association members, and submitted to the Honolulu City Council as part of the 2017-18 Annual Report to the Council. The Waikīkī Beach Management Plan is intended to support and compliment the beach improvement and maintenance actions proposed in this DPEIS.

Kūhiō Sandbag Groin

Beach monitoring following the 2012 Waikīkī Beach Maintenance I project showed continued erosion and beach recession at the east and west ends of the Royal Hawaiian beach sector. Habel (2016) found that beach recession ranged from 5.2 to 9.5 ft/yr at the east end fronting the beach concessions. This erosion exposed the old concrete foundation of the Waikīkī Tavern, creating a hazardous condition for beach users, and has resulted in damage and flanking of the Kūhiō Beach 'Ewa (west) groin.

A sandbag groin was placed 140 ft west of the existing 'Ewa (west) groin of Kūhiō Beach Park. The purpose of the groin is to stabilize the east end of Royal Hawaiian Beach and cover the remnants of the concrete foundation of the Waikīkī Tavern with sand. The designed 95-ft groin length was the minimum length necessary to ensure adequate beach width to keep the concrete rubble covered. At the time of construction, the groin was extended 16 ft on the inshore end to address additional beach erosion.

The Kūhiō Sandbag Groin was completed in November 2019 (Figure 2-7 and Figure 2-8). The groin consists of 83 ElcoRock containers and 275 cy of sand to fill the containers. Each sand container holds 2.5 m^3 of sand and weighs over 10,000 lbs when full. The non-woven geotextile fabric is UV and puncture resistant, has excellent abrasion resistance, and its soft finish is

attractive and non-abrasive. Approximately 750 cy of sand was excavated from Kūhiō Beach park and placed to cover the concrete rubble and fill the cell between groins to its design shape.

The University of Hawai'i Coastal Geology Group (UHCGG) has and is continuing to conduct periodic monitoring of the Kūhiō Sandbag Groin. Initial findings based on approximately one year of survey data indicate that the groin is functioning as intended. The efficacy of the groin is evident by significant sand accumulation on the Diamond Head (east) side of the structure throughout the year, indicating that longshore sediment transport was altered as intended to mitigate extreme erosion along this section of beach. Sediment capture by the groin has not resulted in significant erosion on the 'Ewa (west) side of the structure, which would be evidenced by sediment depletion and flanking directly adjacent to the structure. Overall, one year following completion, the structural integrity and efficacy of the groin structure has been confirmed. No adverse effects of the project have been observed. No significant deficiencies with the ElcoRock sandbags and/or the overall groin performance have been observed.

Royal Hawaiian Groin Replacement

As of 2020, the original Royal Hawaiian groin was in an extremely deteriorated condition. Its failure could have destabilized 1,730 ft of sandy shoreline east of the groin in the Royal Hawaiian beach sector. The Hawai'i Department of Land and Natural Resources (DLNR) initiated design and construction of a new groin to replace the original Royal Hawaiian groin. The objective of the project was to reinforce the existing groin to stabilize the beach on the Diamond Head (east) side of the groin so that it could provide its intended recreational and aesthetic benefits. The new groin was designed to maintain the approximate beach width of the 2012 Waikīkī Beach Maintenance I project.

Replacement of the Royal Hawaiian groin was completed in August 2020 (Figure 2-9 and Figure 2-10). The new groin was constructed along the alignment of the original groin and incorporated a portion of the original groin as a core wall to prevent sand movement through the groin. The new groin is of rock rubblemound construction and incorporates a cast-in-place concrete crown wall. The new groin extends 125 ft from the seawall fronting the Sheraton Waikiki Hotel, and then angles to the southeast to create a 50-ft-long L-head, for a total crest length of 175 ft. The new groin was constructed of a single layer of keyed and fit 3,200 to 5,400 lb armor stone over 300 to 600 lb underlayer stone and 30 to 100 lb core stone.

Following stone placement, a 5-ft wide by 5-ft-thick concrete crown wall was constructed to stabilize the crest and provide a foundation should a future increase in crest elevation be necessary to accommodate sea level rise. The concrete crown wall elevation is +9 ft MSL for its first 40 ft, then transitions down to +6 ft MSL on a 1V:8H (vertical to horizontal) slope, then remains at +6 ft MSL for the remainder of its length. The stone crest elevation is +7 ft MSL for the first 40 ft and then transitions down to +4 ft MSL for the remainder of the groin length. The existing concrete block groin was reduced in elevation to a maximum elevation of +4 to +1 ft MSL to facilitate construction of the new groin. Approximately 40 ft of the original groin, beginning at about 120 ft from shore, was removed to construct the transition to the L-head portion of the new groin. The remainder of the original groin, seaward of the new groin head, was left in place. Initial observations indicate that the groin is performing its primary function to stabilize the beach on the Diamond Head (east) side of the groin. The beach in this area is

currently wider than it was pre-construction, and the shoreline has naturally taken the arc-shape anticipated from the groin design.

Waikīkī Beach Maintenance II

The permits for the 2012 Waikīkī Beach Maintenance I project authorized a second nourishment effort to be performed within 10 years. The project consisted of recovery of approximately 20,000 cy of sand from the same offshore sand deposit that was used in the 2012 project. Sand was pumped into a dewatering basin in the Diamond Head (east) basin of Kūhiō Beach Park. The dewatering basin was approximately 100 ft wide and 300 ft long. Sand was pushed into large piles with an excavator and bulldozer and then transported by dump trucks to the sand placement area on Royal Hawaiian Beach. The project was completed in May 2021 (Figure 2-11 and Figure 2-12).

Related Projects in The Area

The City and County of Honolulu (City) is proposing improvements to the deteriorated Waikīkī Natatorium War Memorial Complex (WMMC). The City proposes to rehabilitate the WMMC by demolishing the submerged structures and reconstructing the deck on support piles to allow free flow of water between the ocean and a swim basin. A Final Environmental Impact Statement (FEIS) for the proposed action was approved on November 23, 2019.

The City is also proposing improvements to the deteriorated seawall fronting the Queen's beach sector. The seawall is deteriorated and has been damaged by wave action. The City proposes to repair or reconstruct the seawall. A Draft Environmental Assessment (DEA) for the proposed action was published on June 8, 2017.

These projects are unrelated to the Waikīkī Beach Improvement and Maintenance Program as they are located outside of the project area and are not intended to improve the condition of the beaches or improve lateral shoreline access. These projects are not anticipated to have any direct or secondary effects on the actions proposed in this DPEIS.

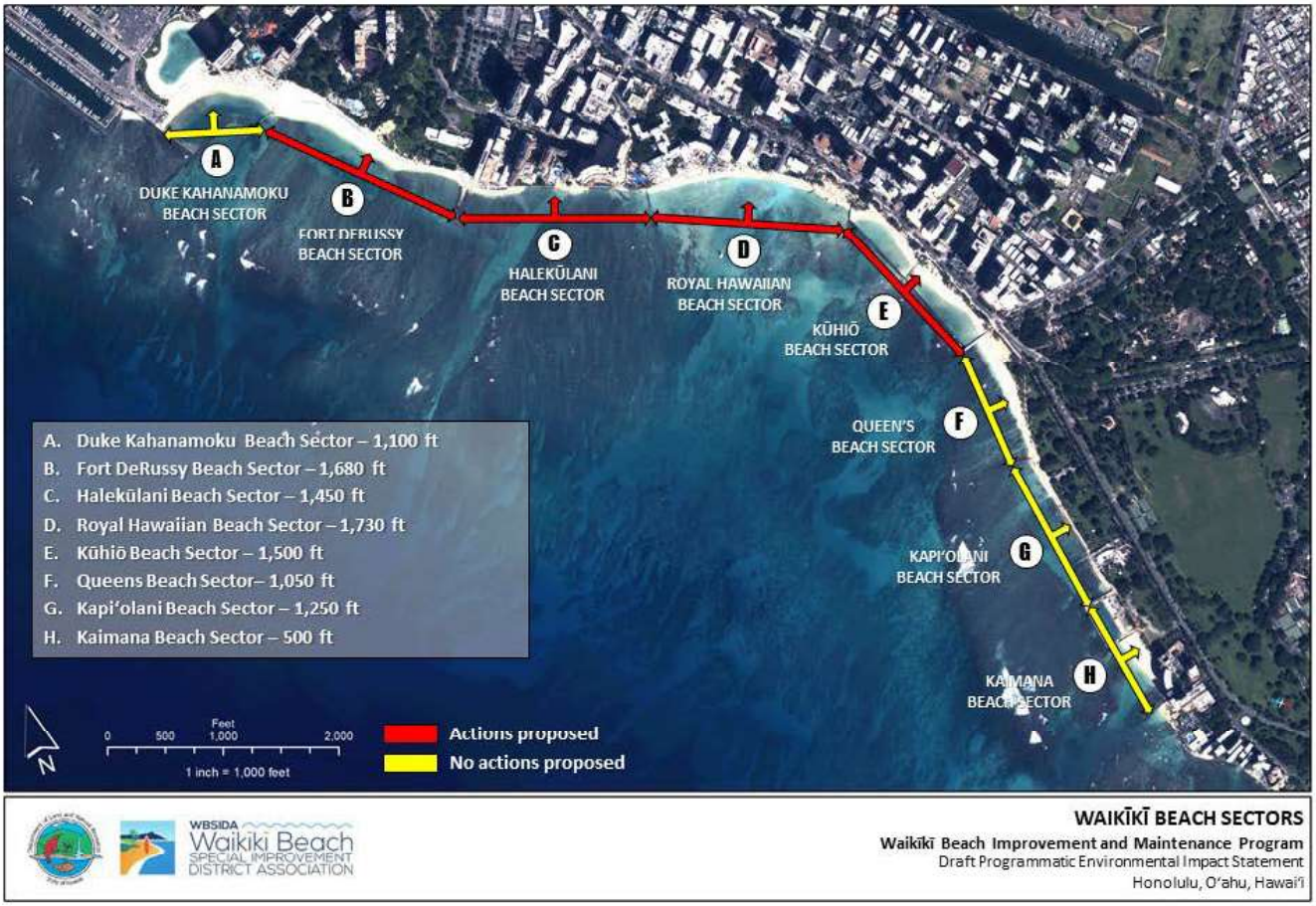

Figure 2-3 Waikīkī beach sectors

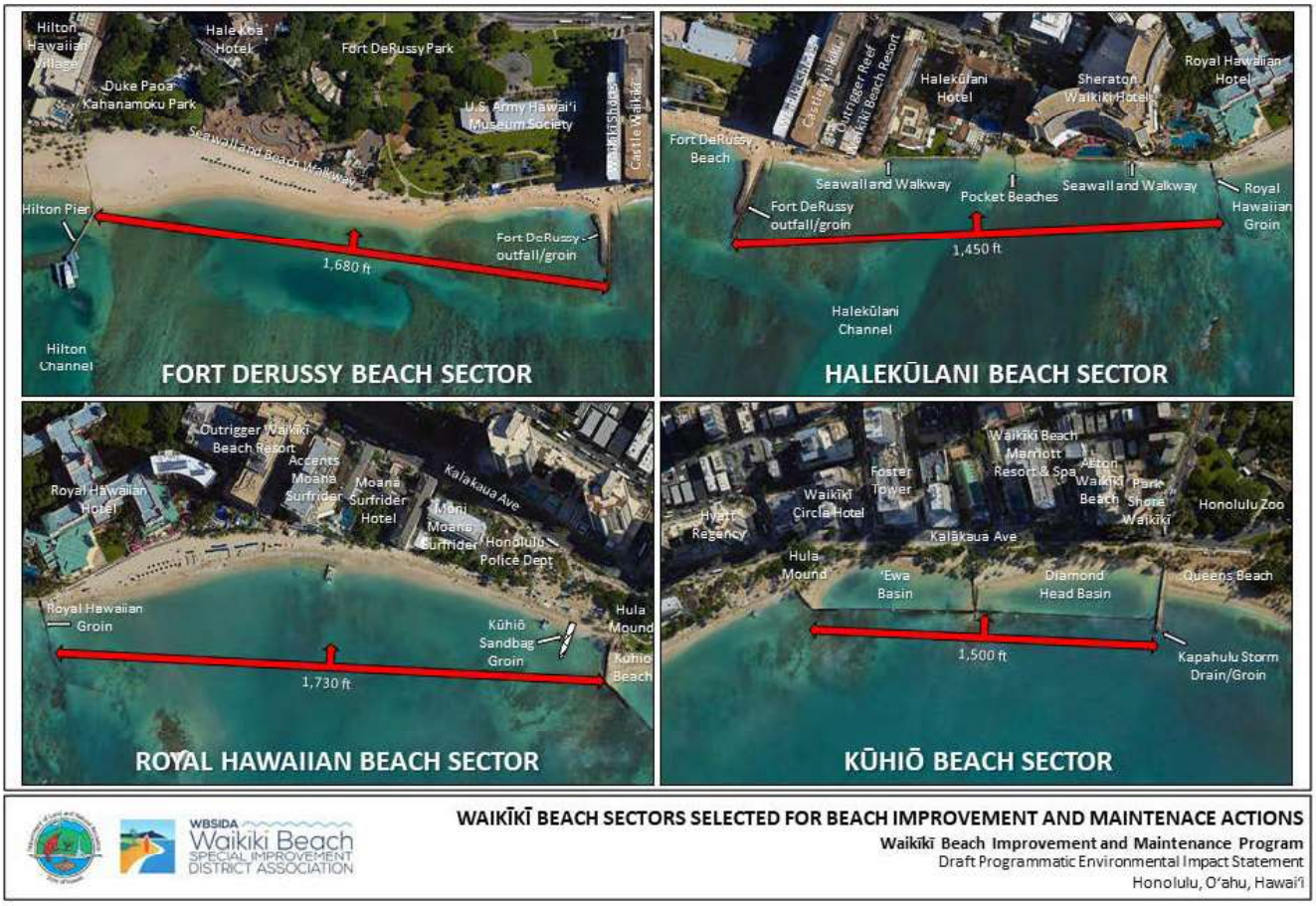

Figure 2-4 Waikīkī beach sectors selected for improvement and maintenance actions

Exhibit 2: draft EIS Introduction

Figure 2-5 Conditions before Waikīkī Beach Maintenance I (Sep 2009)

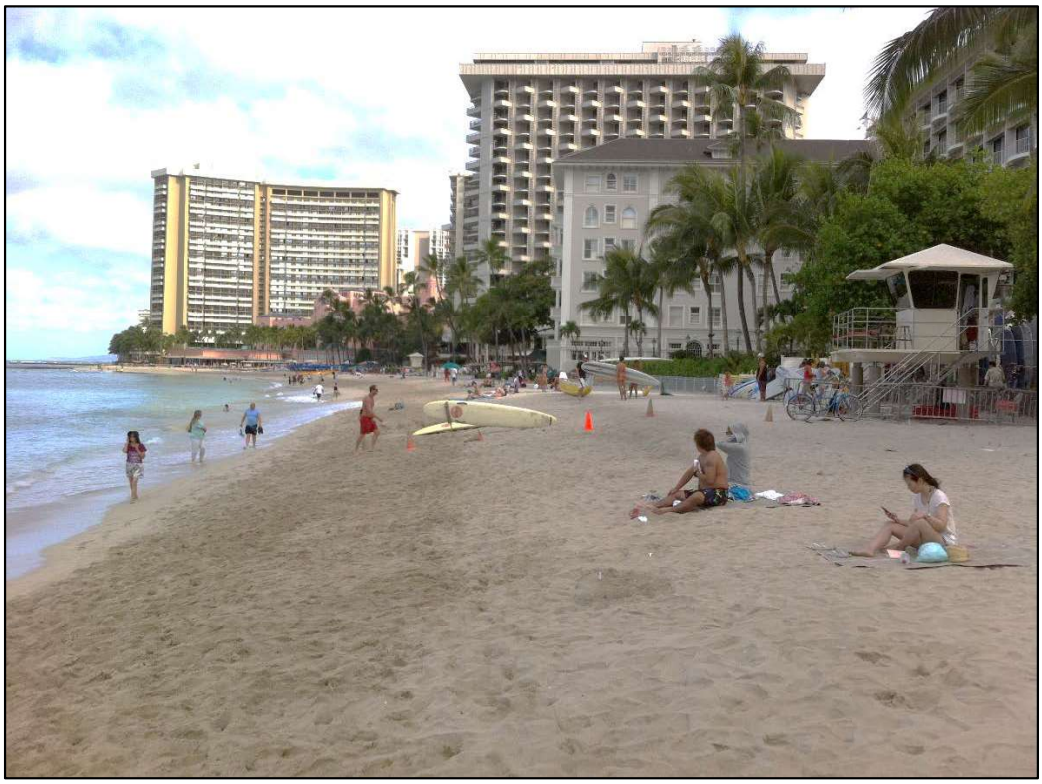

Figure 2-6 Conditions after Waikīkī Beach Maintenance I (Nov 2019)

Figure 2-7 Conditions before construction of Kūhiō Sandbag Groin (Nov 2017)

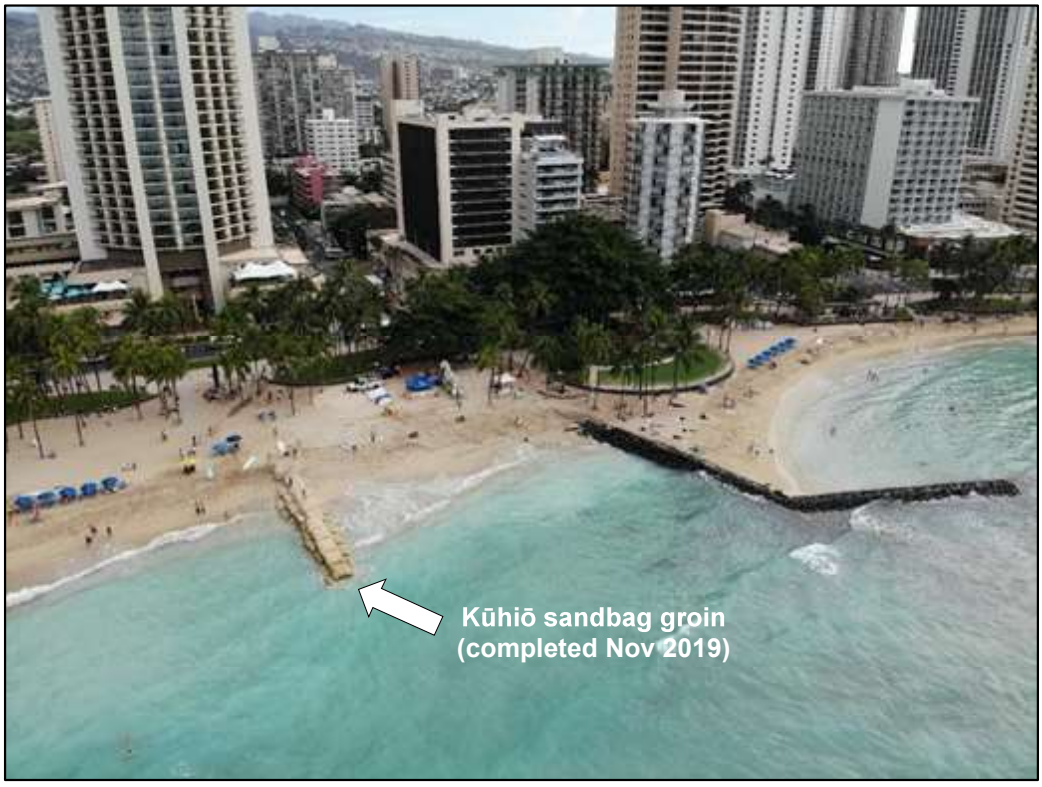

Figure 2-8 Conditions after construction of Kūhiō Sandbag Groin (Nov 2019)

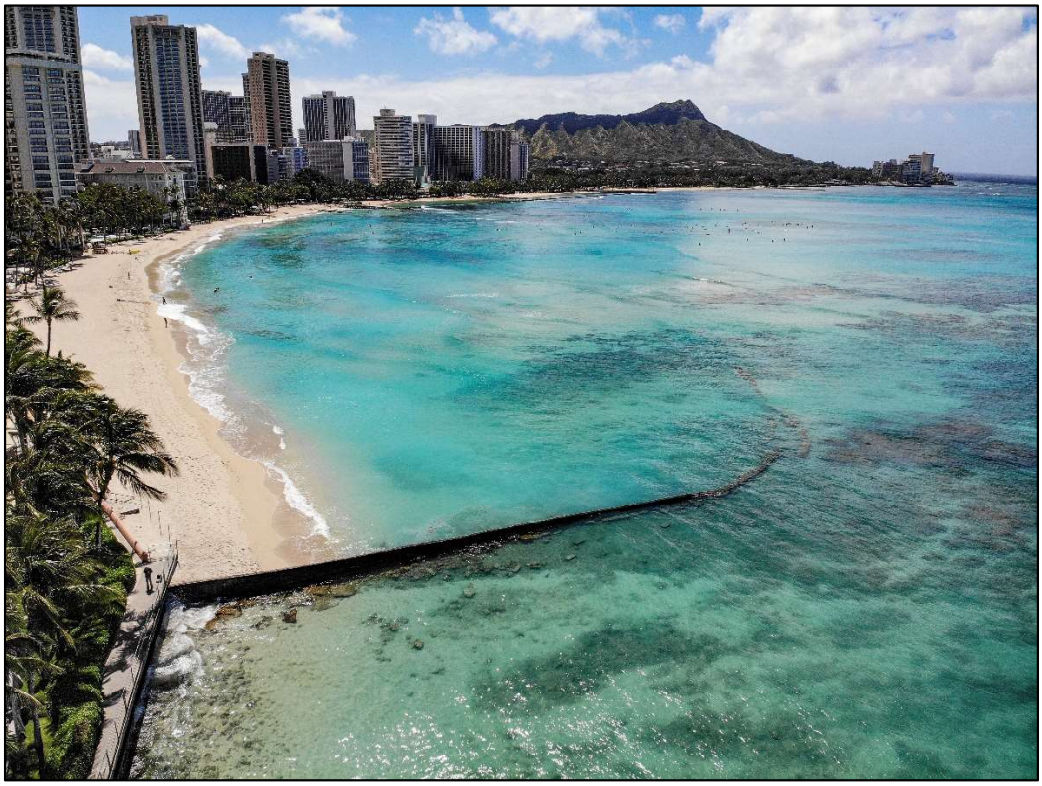

Figure 2-9 Conditions before reconstruction of Royal Hawaiian groin (May 2020)

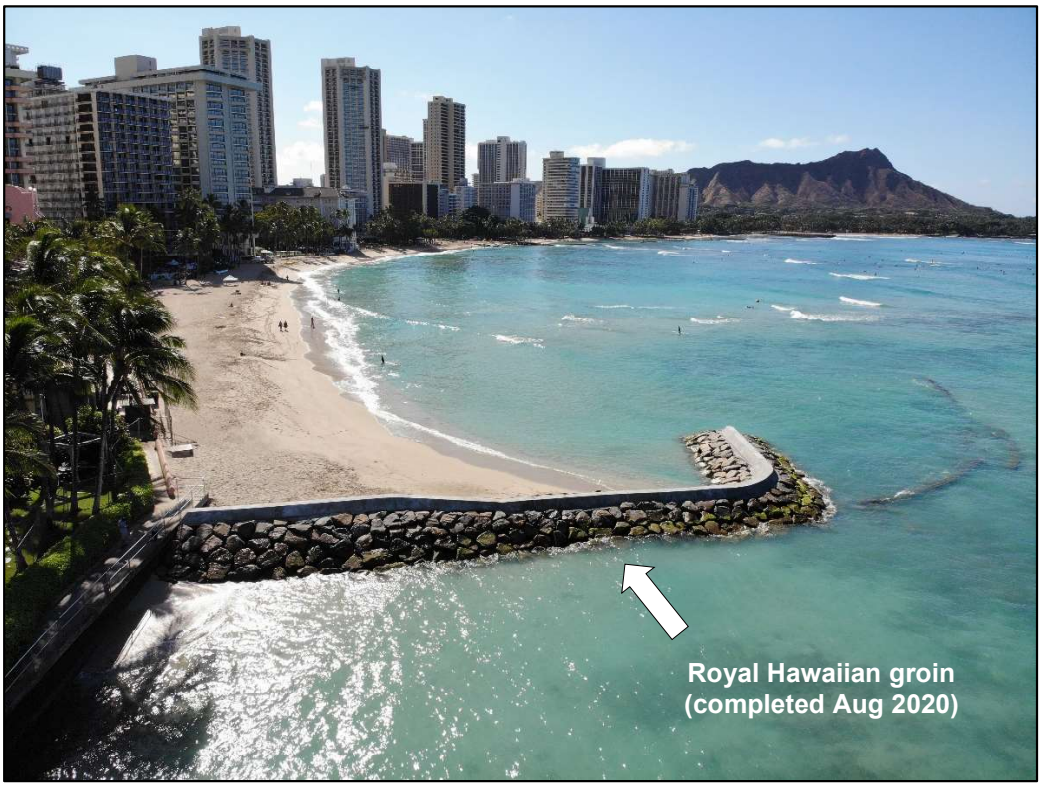

Figure 2-10 Conditions after reconstruction of Royal Hawaiian groin (August 2021)

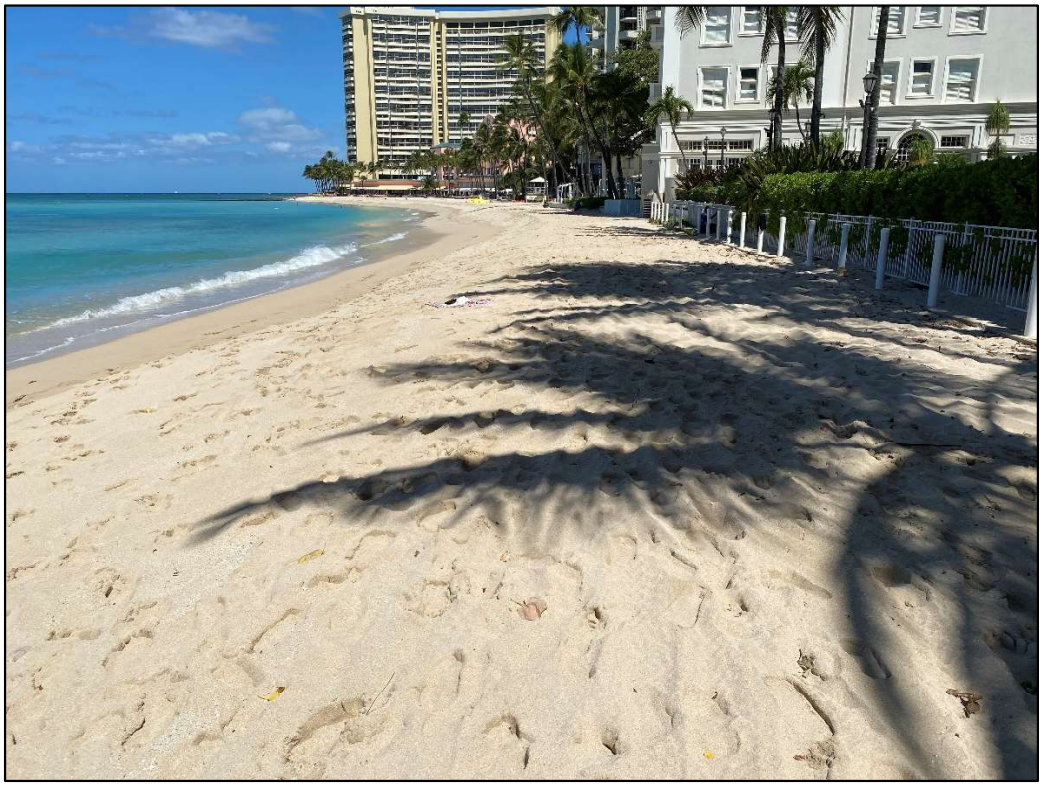

Figure 2-11 Conditions before Waikīkī Beach Maintenance II (May 1, 2021)

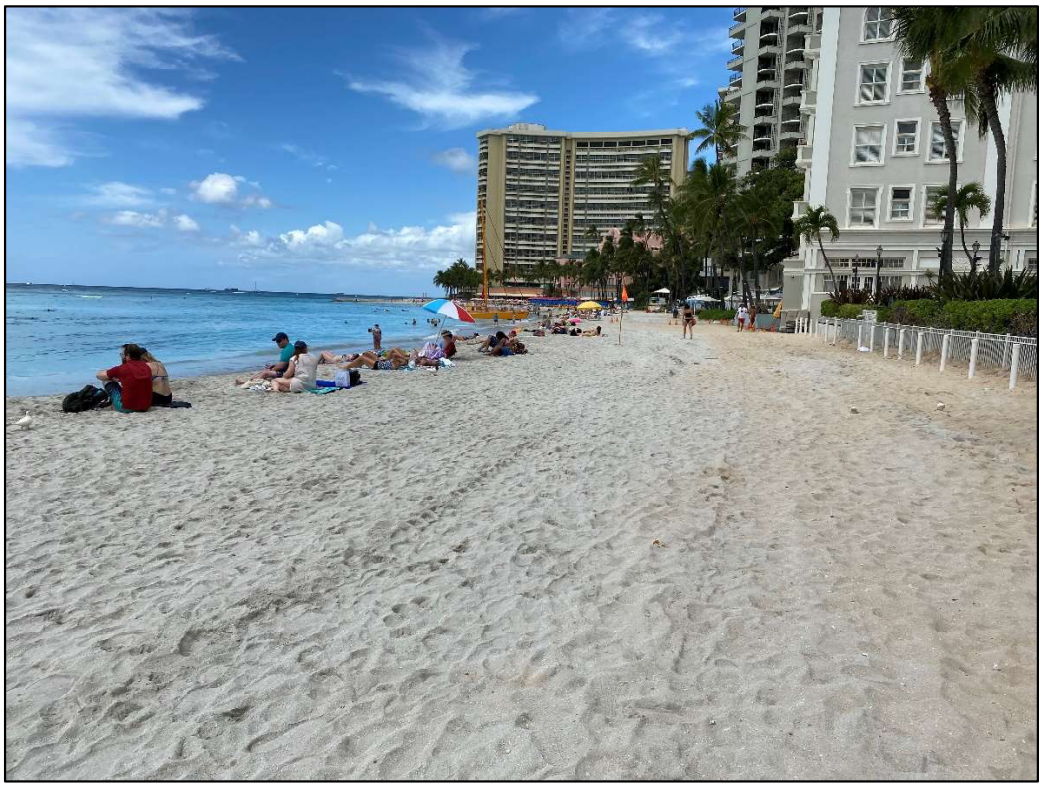

Figure 2-12 Conditions after Waikīkī Beach Maintenance II (May 5, 2021)

"Slippery Wall"
In 1953, a 750-ft-long retaining wall was built between the 1939 crib wall and the Kapahulu storm drain/groin to keep sand from eroding away. This wall is called "Slippery Wall" because of its slick surface when wet due to the growth of fine seaweed (Clark 1977:53; Wiegel 2008:17, 27). It forms the boundary of the Diamond Head (east) basin of the Kūhiō groin complex. The beach sand along Kūhiō Beach has been supplemented several times, including through offshore dredging ca. 2000 (Wiegel 2008:19).

9.2.5 Ka Paʻakai Cultural Impact Analysis

The State of Hawaiʻi has a responsibility to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups. This includes ensuring that legitimate customary and traditional practices of Native Hawaiians be protected to the extent feasible.

The Hawaiʻi Supreme Court in *Ka Paʻakai O Ka `Aina v. Land Use Commission* (2000) suggested three tests for agencies to protect traditional and customary Native Hawaiian practices to the extent feasible. The tests include assessment of the following:

A. The identity and scope of valued cultural and historical or natural resources in the petition area including the extent to which traditional and customary Native Hawaiian rights are exercised in the petition area;
B. The extent to which those resources including traditional and customary Native Hawaiian rights will be affected or impaired by the proposed action; and
C. The feasible action, if any, to be taken by the state to reasonably protect Native Hawaiian rights if they are found to exist.

Waikīkī is a predominantly engineered shoreline. The current shoreline configuration is largely the result of past efforts to widen and stabilize the beaches. The project area consists of eight littoral cells (beach sectors), four of which have been selected for beach improvement and maintenance actions. The boundaries of the beach sectors are primarily defined by engineered structures (e.g., groins, breakwaters, seawalls) that influence coastal processes. Beach width and stability vary by sector.

The project area falls within the *ahupuaʻa* of Waikīkī in the traditional *moku* (district) of Kona. The traditions of Waikīkī indicate its significance as a nexus of interconnected *aliʻi* histories and as a highly productive agricultural region. In ancient times, Waikīkī was a center of *aliʻi* power, "a land beloved of the chiefs" who resided there because the lands were rich, and the surfing was excellent (Kamakau 1991:44). The significance of Waikīkī *ahupuaʻa* is also emphasized by the number and kinds of heiau distributed across this area, particularly along the coast (Kamakau 1976:144; Thrum 1907:44-45).

During the past 130 years, the Waikīkī shoreline has been substantially engineered to create larger sandy beaches for recreation and tourism. As such, most of the proposed beach improvement and maintenance program will occur within modern beach deposits seaward of the 19th century and early 20th century shorelines.

A. The identity and scope of valued cultural and historical or natural resources in the petition area including the extent to which traditional and customary Native Hawaiian rights are exercised in the petition area.

Traditional cultural practices in the Waikīkī area include gathering, fishing, diving, contemplation, spiritual and physical healing, canoe paddling, surfing, and other ocean activities. There have been numerous Cultural Impact Assessments (CIA) for previous projects in Waikīkī, some of which address the shoreline and areas immediately inshore of the active beach system, including portions of the four Waikīkī beach sectors selected for improvement and maintenance actions (Fort DeRussy, Halekūlani, Royal Hawaiian, and Kūhiō Beach). The CIA for the Waikīkī Beach Improvement and Maintenance Program was completed by International Archaeology, LLC in March 2021, and is included as Appendix D.

The most frequently mentioned concern in the previous and current CIA studies was the inadvertent exposure of cultural material, particularly iwi kūpuna (ancestral remains or bones), during ground-disturbing construction work along the shoreline or in the offshore sand deposits that will be dredged to expand and replenish the beaches.

The second most frequently mentioned concern in the previous and current CIA studies involved past and present ocean and shoreline cultural-natural resources, particularly fishing, gathering, and potential impacts to marine habitat. Kawehewehe (at the boundary between the Fort DeRussy and Halekūlani beach sectors) was also frequently mentioned as both a historical and ongoing place of spiritual and physical healing, where the sick undergo ritual bathing. Traditional Native Hawaiian healing and purification rituals are still practiced in the waters of Kawehewehe, and *limu kālā*—a plant used in healing and *hoʻoponopono* ceremonies—may still grow in the area.

The third most frequently mentioned concern was the ongoing development of Waikīkī, particularly obstruction of mauka-to-makai view corridors by tall buildings/hotels, harm to associated cultural features on the landscape, increasing demands on infrastructure in Waikīkī, including traffic, noise and waste management problems, and most critically, the loss of a "Hawaiian sense of place" and the feel of "old Waikīkī."

A. The extent to which those resources including traditional and customary Native Hawaiian rights will be affected or impaired by the proposed action.

Iwi Kūpuna

The proposed actions have the potential to encounter or disturb iwi kūpuna at three potential locations: 1) backshore (mauka of the shoreline), 2) foreshore (active beach system), and 3) offshore (sand deposits).

<u>Backshore (Terrestrial Area)</u>

Surface and subsurface cultural resources have been identified in the backshore (terrestrial) area inshore of the project area (active beach system). Resources in the backshore (terrestrial) area have been heavily impacted by previous and ongoing development activities. The most predominant resource in the backshore, based on previous investigations, are in situ and

disturbed iwi kūpuna. The resources are located mauka (landward) of the proposed actions, and no excavation or ground-disturbing activities are proposed in the backshore (terrestrial) portion of the project area. The proposed beach improvement and maintenance actions will widen and stabilize the existing beaches, thereby providing a protective buffer for any burials or cultural materials that may exist inshore of the active beach system.

Foreshore (Beach)

While the beaches of Waikīkī are almost entirely composed of imported sand and unlikely to contain primary burials, there are concerns regarding the history and sources of the sand used to build and replenish the beaches during the 20th century.

From about 1930 until the late 1970s, it is estimated that over 400,000 cy of sand has been placed on Waikīkī Beach, from a variety of sources including other beaches on Oʻahu and Molokaʻi, inland dune deposits, and even crushed coralline limestone. It is not known whether sand containing iwi kūpuna has ever been redeposited in the project area or has eroded into offshore deposits. Much of the information regarding historical beach nourishment efforts is anecdotal and based on oral accounts. Given the lack of historical data, it would be difficult to ascertain where and when the sand was acquired and imported into Waikīkī.

While no cultural or archaeological resources (including iwi kūpuna) have currently been discovered within the project area, the applicant is aware that cultural or archaeological resources may be identified during public notices and community meetings. If iwi kūpuna were encountered in the foreshore (active beach system), it would be difficult or impossible to confirm the ancestry of the remains or identify lineal descendants. In summary, the proposed actions are not anticipated to encounter or affect iwi kūpuna in the foreshore (active beach system).

Offshore (Sand Deposits)

The sand required for the proposed beach nourishment and maintenance actions would be almost exclusively recovered from submerged deposits located offshore of Waikīkī. Sand would be recovered using submersible slurry pumps, self-contained hydraulic suction dredges, and/or clamshell buckets. There are concerns regarding the potential disturbance of modern human remains in the submerged sand deposits immediately offshore of Waikīkī where cremated human remains are frequently spread.

The applicant acknowledges and appreciates the history and practice of spreading cremated human remains in the offshore waters of Waikīkī. However, the likelihood of encountering iwi kūpuna in these areas is considered to be relatively low and it would be very difficult to differentiate cremated remains from marine carbonate sand. The cremation process applies extreme temperature to the body, completely incinerating everything and reducing the body to bone fragments, which are mechanically pulverized down to a coarse, sand-like material. The cremated remains (commonly referred to as “ashes”) consist of inorganic material largely composed of Calcium Phosphate, which is typically a pale to dark gray powder that is similar in texture and appearance to coarse sand. Given the similarities between cremated remains and marine carbonate sand in terms of particle size and color, it would be difficult or impossible to identify or differentiate cremated remains from marine carbonate sand.

The proposed sand recovery areas located offshore of Waikīkī are dynamic and mobile. The *Ala Moana* and *Hilton* sand deposits are reef-generated deposits, so the potential for these deposits to contain iwi kūpuna is considered to be relatively low. The *Canoes/Queens* sand deposit is closer to the shoreline; however, this deposit is very mobile and has dredged multiple times during previous beach nourishment projects.

It is likely that any cremated remains spread within the vicinity of the proposed sand recovery areas would be immediately dispersed within the water column. The non-uniform dispersion of the cremated remains reduces the likelihood of encountering in situ deposits. If iwi kūpuna were encountered in the offshore sand deposits, it would be difficult or impossible to confirm the ancestry of the remains or identify lineal descendants. In summary, the proposed actions are not anticipated to encounter or affect iwi kūpuna in the offshore sand recovery areas.

Traditional and Cultural Practices

The applicant recognizes and appreciates the various Native Hawaiian traditional and cultural activities that are practiced in Waikīkī, particularly surfing, fishing, gathering, and spiritual and physical healing. The proposed actions may temporarily curtail these activities. During construction, the use of some portions of the shoreline and offshore sand recovery areas may be prevented for public health and safety reasons. In addition, dredging operations will be visible from the shoreline. These impacts will be short-term in nature. Upon completion, the proposed actions will not curtail these activities. In summary, valued Native Hawaiian traditional and cultural practices are not anticipated to be adversely affected should the proposed actions be approved and implemented.

Natural Resources

The applicant recognizes and appreciates the quality and value of marine resources in Waikīkī. The proposed actions have the potential to temporarily affect marine species and habitat. *Honu* (green sea turtles) are regularly observed swimming and foraging in the nearshore waters within the project area; however, no obvious *honu* congregation or nesting areas have been observed. Hawaiian monk seals (*Monachus Schauinslandi*) have also been observed in Waikīkī. The seafloor and all subsurface waters and marine habitat within 10 m of the seafloor, through the water's edge 5 m into the terrestrial environment from the shoreline are considered critical habitat for Hawaiian monk seals.

The proposed actions may temporarily inhibit foraging opportunities for marine species. In-water construction work (e.g., dredging, groin construction) may result in significant underwater sound that could potentially affect marine species. The following Best Management Practices (BMPs) and avoidance and minimization measures will be implemented to mitigate potential effects on marine species and habitat to the maximum extent practicable.

1. Turbidity containment devices (e.g., silt fencing, turbidity curtains) shall be installed around the areas of groin construction and sand placement.
2. Visual monitoring for turbidity outside the confines of the turbidity curtains shall be conducted. In the event that turbidity is observed outside of the turbidity curtains, work shall stop, and the turbidity curtains shall remain in place until the turbidity dissipates.

turbidity curtains shall be inspected after dissipation and prior to returning to project operations.

3. All construction personnel on site shall be informed of the potential for federally protected marine species that may occur within or transit through the project area. It shall be made clear that any intentional physical interactions with any identified federally protected marine species is explicitly prohibited.
4. A competent observer shall be designated to observe the construction work areas and areas immediately adjacent to the work for the presence of federally protected marine species, including but not limited to, green sea turtles, hawksbill sea turtles, and Hawaiian monk seals. Visual surveys for these species shall 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 federally protected marine species are within 150 ft of the work area.
5. A 150-ft safety zone shall be established around the project areas where a competent observer shall visually monitor the zone for the presence of federally protected marine species 30 minutes prior to, and 30 minutes post project in-water activity. The observer shall record information on the species, numbers, behavior, time of observation, location, start and end time of project activity, characteristics of the marine species, and any observed disturbances of the work on the species (visual or acoustic).
6. Activity shall be conducted only if the safety zone is clear of all marine federally protected species.
7. Upon sighting of a federally protected marine species within the safety zone during project activity the activity shall immediately halt until the animal has left the zone. In the event that a federally protected marine species enters the safety zone and the project activity cannot be halted, observations shall be made and NOAA-NMFS staff in Honolulu shall be immediately contacted to facilitate agency assessment of collected data. Work may continue only if there is no possibility for the activity to adversely affect the animal.
8. All equipment and material shall be free of contaminants of any kind including but not limited to excessive silt, sludge, anoxic or decaying organic matter, clay, dirt, oil, floating debris, grease or foam or any other pollutant that would produce an undesirable condition to the shoreline or water quality.
9. Cease construction work if unusual conditions, such as large tidal events or high surf conditions affect the project site, except for efforts to avoid or minimize damage to natural resources, such as the temporary removal of turbidity curtains.
10. Construction site inspections and debris sweeps will be made at the end of each workday, and all project related debris and trash shall be removed and disposed of. Equipment that is not actively being used shall be properly stored and secured so as not to cause unintended damage to the beach or adversely affect any federally protected marine species. A full inspection of the project site shall be conducted at the end of the project to ensure that no visible debris or project waste is present upon completion of the project.
11. Nighttime work and/or work requiring artificial light sources is prohibited. No new permanent lighting shall result from the proposed actions.
12. Any incidental injuries or take of green or hawksbill sea turtles on land shall be immediately reported to the U.S. Fish and Wildlife Service.

13. Any incidental injury or take of green or hawksbill sea turtle or Hawaiian monk seal in the water shall be immediately reported to NOAA-NMFS and the Pacific Island Protected Species Program Manager, Southwest Region.

By using the above BMPs, noise/physical disturbance to *honu* and Hawaiian monk seals is anticipated to be temporary and unlikely to result in adverse behavioral changes. Based on the in-water work being conducted in very shallow water with turbidity containment barriers surrounding the work areas, any exposure of federally protected marine species to turbidity is expected to be temporary and not significant. No significant loss of foraging area is anticipated.

The structures proposed in the Halekūlani and Kūhiō beach sectors have the potential to improve biodiversity and habitat for marine species. The interstitial spaces between the armor stones provide additional habitat for cryptic benthic (crabs, shrimps, worms, etc.) and sessile organisms (sponges and tunicates) that provide additional foraging resources for fishes. The Iroquois Point Beach Nourishment and Stabilization project, which was completed in 2013, utilized groins that are similar to those being proposed in Waikīkī. Post-construction monitoring from 2013-present found a 25-fold increase in fish abundance, not counting small baitfish, and a doubling of species richness (number of species). Fish biomass is more than 6 times greater than prior to construction. The greatest change occurred in the vicinity of the new habitat created by the groin structures. Other changes in the vicinity of the groins include an increase in crustose coralline algae cover from 1% to 60%, coral cover increase from 0 to 0.6% and macroinvertebrate cover from 1.4% to 6.3%. Coral abundance in the groin vicinity increased from 0 to 16 colonies per 10m². These changes are attributable to the creation of hard, stable habitat for colonization. In summary, the proposed actions are not anticipated to adversely affect federally protected marine species or habitat.

Kawehewehe

The applicant recognizes and appreciates the cultural significance of Kawehewehe as a historical and ongoing place of spiritual and physical healing. Kawehewehe was the residence of the Luluka family of noted Hawaiian historian, John Papa ʻĪʻī. The family moved to Oʻahu in the early 1800s, in the company of Kamehameha who was preparing for the invasion of Kauaʻi (ʻĪʻī 1959:15); Papa ʻĪʻī's uncle was a member of the royal court, and members of the Luluka family were responsible for the royal residence of Kamehameha at Puaʻaliʻiliʻi at Helumoa. Kawehewehe was the outflow from the large fishpond complex of Kālia and marks the ʻEwa (west) end of the Halekūlani beach sector (roughly the alignment of Saratoga Road).

The proposed action in the Halekūlani beach sector may temporarily curtail these uses. During construction, access and use of some portions of the shoreline and offshore areas may be prevented for public health and safety reasons. In addition, dredging operations will be visible from the shoreline. These impacts will be short-term in nature. Upon completion, the proposed action will not curtail these activities. In summary, valued Native Hawaiian traditional and cultural practices at Kawehewehe are not anticipated to be adversely affected should the proposed actions be approved and implemented.

Development
The applicant understands and appreciates concerns that have been expressed in regard to the intensity of past and ongoing development in Waikīkī. Impacts to viewplanes, increasing demands on infrastructure, and the loss of a "Hawaiian sense of place" and the feel of "old Waikīkī" are recognized issues in Waikīkī. The applicant also acknowledges that the beaches are intrinsically linked to the development of Waikīkī. Without the beaches, it is unlikely that Waikīkī would have evolved into the world-class tourism destination that it is today.

The proposed actions are limited to the foreshore (active beach system) makai of the shoreline and are consistent with historical and ongoing uses in this area. The proposed actions will improve the condition of the Waikīkī shoreline by increasing recreational dry beach area, increasing beach stability, improving lateral shoreline access, and enhancing existing viewplanes. The proposed structures (i.e., groins, segmented breakwater) will be similar in size and appearance to the structures that currently exist in Waikīkī. While the proposed actions are unlikely to restore a "Hawaiian sense of place" or the feel of "old Waikīkī", they will not negatively affect the intrinsic value of Waikīkī. In summary, the proposed actions are not anticipated to affect or intensify existing or future development patterns in Waikīkī.

B. The feasible action, if any, to be taken by the state to reasonably protect Native Hawaiian rights if they are found to exist.

To address these concerns, the applicant will take the following actions:

1. *Carefully evaluate new sources of replenishment sand to confirm they do not contain iwi kūpuna or other cultural material.*

   The applicant will develop and implement an archaeological monitoring plan. An archaeological monitor will be present during implementation of the proposed actions. While no excavation is proposed, the applicant acknowledges that the installation of certain environmental Best Management Practices (e.g., silt fencing, turbidity curtains) may constitute "ground alteration", and that an archaeological monitor should be present. Should any iwi kūpuna or cultural materials be discovered, the proper authority shall be notified. The proposed beach improvement and maintenance actions will widen and stabilize the existing beaches, thereby providing a protective buffer for any burials or cultural materials that may exist inshore of the active beach system.

2. *Monitor all ground-disturbing project work within the historical (pre-20th century) shoreline areas for exposed or disturbed cultural material and develop a plan to protect these resources in consultation with cultural stakeholders/organizations and appropriate government agencies.*

   The applicant will develop and implement an archaeological monitoring plan. An archaeological monitor will be present during implementation of the proposed actions. While no excavation is proposed, the applicant acknowledges that the installation of certain environmental Best Management Practices (e.g., silt fencing, turbidity curtains) may

constitute "ground alteration", and that an archaeological monitor should be present. Should any iwi kūpuna or cultural assets be discovered, the proper authority shall be notified.

3. *Reasonably address concerns from community members about the disposition of cremated remains.*

   The applicant will continue to engage the community and local stakeholders to address the concerns related to the disposition of cremated remains. A public scoping meeting will be held during the 45-day public comment period for the Draft Programmatic Environmental Impact Statement (DPEIS).

4. *Protect Kawehewehe from damage and allow cultural practitioners reasonable access to the area during construction work.*

   The applicant will seek to minimize potential impacts to Kawehewehe to the maximum extent practicable. The project was designed to avoid contact with any portion of Kawehewehe, and to minimize impacts to Native Hawaiian practitioners at the site. The Kawehewehe area will be clearly delineated in project plans, and efforts will be made to avoid burying or damaging the area during construction. The applicant will make a good faith effort to accommodate the needs of Native Hawaiian practitioners in the region during construction. Native Hawaiian practitioners will be provided regular and reasonable access to the waters throughout the duration of the project; however, access to certain areas will be temporarily restricted in order to ensure public health and safety. Upon completion, the proposed action will not curtail any of these important cultural activities and practices.

5. *Regularly engage cultural stakeholders and the local community in future project planning.*

   The applicant has conducted extensive outreach and stakeholder engagement in development of the Waikīkī Beach Improvement and Maintenance Program. A critical component of the project was the establishment of the Waikīkī Beach Community Advisory Committee (WBCAC), which was formed in 2017 to provide a forum to engage stakeholders and provide guidance and feedback on design criteria and rationale for beach improvement and maintenance projects in Waikīkī. The WBCAC is composed of various stakeholders representing business (34%), government (30%), hotels (15%), non-profit organizations (12%), and science and engineering (9%).

   The WBCAC serves as a representative body to communicate the diversity of perspectives and priorities in the broader Waikīkī community, provide guidance and feedback for beach management and planning activities in Waikīkī, and ensure that future beach management projects address the issues and concerns of the Waikīkī community and local stakeholders. The WBCAC was directly involved in determining the priorities and objectives for each beach sector, establishing planning and design criteria, evaluating conceptual options, and providing feedback on the conceptual designs for the proposed actions. The WBCAC held six (6) formal meetings from Nov 2017 to Jan 2021. The WBCAC meeting agendas and outcomes are included as Appendix A of the DPEIS.

In addition, the applicant has held two (2) public scoping meetings and will continue to solicit guidance and feedback from the community regarding the potential impacts of the proposed actions. A public scoping meeting will be held during the 45-day public comment period for the Draft Programmatic Environmental Impact Statement (DPEIS). The applicant will also engage in a formal consultation with the Hawai'i Department of Land and Natural Resources, State Historic Preservation Division (SHPD) to determine if any additional cultural Best Management Practices are recommended or required. If cultural assets are discovered, all work will cease and SHPD will be notified.

9.2.6 Potential Impacts and Mitigation Measures

Waikīkī has a rich historical and cultural legacy. There do not appear to be any known traditional Hawaiian cultural practices that would be adversely affected by the proposed actions, nor does it appear that the activities associated with the proposed actions will conflict with traditional cultural practices as expressed in legend. The proposed actions will be implemented in an area that has been substantially altered over more than a century and is entirely makai (seaward) of the shoreline where the existence of any cultural artifacts or remains is unlikely.

Four aspects of the program make it unlikely that the proposed beach improvement and maintenance actions will have a significant adverse effect on historical, cultural, archaeological, or architectural resources, or any on rights customarily and traditionally exercised for subsistence, cultural and religious purposes:

1. Implementation of the proposed actions does not involve construction on or excavation of backshore land areas that might contain physical remains. Work on land will take place only on the beach and submerged lands. Care will be taken when working on the beach to avoid disturbing previously undisturbed sandy sediments that might hide subsurface deposits.

2. Construction of the new structures (groins and segmented breakwater) will take place completely on submerged lands, seaward of the shoreline, and will not involve modification of soft deposits which could reasonably be expected to have the potential to hide archaeological materials or burials.

3. The likelihood of encountering iwi kūpuna in the offshore deposits is considered to be relatively low. The cremation process applies extreme temperature to the body, completely incinerating everything and reducing the body to bone fragments, which are mechanically pulverized down to a coarse, sand-like material. The cremated remains (commonly referred to as "ashes") consist of inorganic material largely composed of Calcium Phosphate, which is typically a pale to dark gray powder that is similar in texture and appearance to coarse sand. Given the similarities between cremated remains and marine carbonate sand in terms of particle size and color, it would be difficult or impossible to identify or differentiate cremated remains from marine carbonate sand. It is not known whether sand containing iwi kūpuna has ever been redeposited in the project area or has eroded into offshore deposits. Much of the information regarding historical beach nourishment efforts is anecdotal and based on oral accounts. Given the lack of historical data, it would be difficult to ascertain where and when the sand was acquired

and imported into Waikīkī. If human remains were encountered, it would be very difficult to confirm the identity of the deceased or lineal descendancy.

4. Construction of the new groins and beach fill in the Halekūlani beach sector is not anticipated to affect submarine groundwater discharge at Kawehewehe. The proposed action does not include shore parallel structures penetrating to depths that would prevent submarine groundwater discharge, including tidal pumping. Sand would not be a barrier to flow, it would just make the seepage more diffuse, so submarine groundwater discharge would be significantly altered (H. Dulai, personal communication, April 19, 2021). If there is submarine groundwater discharge coming out of this sector, the ocean current-dampening action of adding groins (as is its function) would pond (decrease oceanic mixing) and thus increase the residence time of any groundwater that has been discharged (C. Glenn, personal communication, April 19, 2021). As a result, the proposed action is not anticipated to affect submarine groundwater discharge or any ongoing Native Hawaiian cultural practices at Kawehewehe.

9.2.6.1 Fort DeRussy Beach Sector

The proposed action for the Fort DeRussy beach sector includes the addition of approximately 1,500 cy of sand fill near the Diamond Head edge. A sand borrow area is proposed at the ʻEwa end of the sector adjacent to the Hilton pier/groin. The proposed action will be confined to the area makai of the Fort DeRussy seawall, which consists of beach constructed during the 20th century. Any ground disturbance makai of the ca. 1881 and ca. 1928 shorelines has the potential to encounter archaeological deposits; Site 50-80-14-4570 at the Diamond Head end of the sector is inland of the present promenade.

The addition of sand fill is unlikely to result in significant ground disturbance. However, due to the proximity of previously recorded buried deposits and burials, archaeological monitoring will be conducted during all work within the historical shorelines. Monitoring will not be conducted for work at the sand borrow area since this is an area of relatively recent sand accretion. Prior to commencement of the proposed action, the applicant will prepare a Historic American Engineering Record (HAER) for the Fort DeRussy outfall/groin.

9.2.6.2 Halekūlani Beach Sector

The proposed action for the Halekūlani beach sector will include the addition of approximately 60,000 cy of sand fill between +8.5 ft and -3 ft MSL, and construction of five groins between the Royal Hawaiian groin and the Fort DeRussy outfall/groin. Because the proposed work is expected to occur makai of the existing seawalls, shown in a 1932 photograph with no beach on its seaward side, there is a negligible likelihood of archaeological materials in the present active beach.

Given the proximity of cultural deposits and burials associated with Sites 4570 and 9957, ground disturbance mauka of the ca. 1881/ca. 1928 shorelines has the potential to encounter cultural deposits or burials. Because the area makai of the existing seawall is unlikely to contain beach sand or natural sediments pre-dating the 1930s, project work in this location has little potential to encounter archaeological resources or burials.

The addition of sand fill is unlikely to result in significant ground disturbance. However, due to the proximity of previously recorded buried deposits and burials, significant traditional places, and multiple LCA lots, archaeological monitoring will be conducted during all work within the historical shorelines. Prior to commencement of the proposed action, the applicant will prepare a Historic American Engineering Record (HAER) for the existing groins.

9.2.6.3 Royal Hawaiian Beach Sector

The proposed beach nourishment action for the Royal Hawaiian beach sector will include the addition of approximately 25,000 cy of sand fill between +8.5 and -2 ft MSL. The proposed action will partially overlap the ca. 1881 and ca. 1928 shorelines as illustrated by Bishop (1881) and Kanahele (1928c). Any ground disturbance makai of the ca. 1881/ca. 1928 shorelines in the Royal Hawaiian beach sector has the potential encounter cultural deposits or burials. The presence of a partially buried seawall and possible Waikīkī Tavern foundation at the Diamond Head end of the Royal Hawaiian sector suggests that intact beach sediments may extend into the mauka portion of the project area; as a result, cultural deposits and burials such as those found along Kalākaua Avenue may occur within the beach nourishment area.

The addition of sand fill is unlikely to result in significant ground disturbance. However, due to the proximity of previously recorded buried deposits and burials, significant traditional places, and chiefly residences, archaeological monitoring will be conducted during all work within the historical shorelines. Prior to commencement of the proposed action, the applicant will conduct a historic preservation documentation and review of the remaining portions of the original Royal Hawaiian groin, the exposed seawall, and the Waikīkī Inn/Tavern foundation.

9.2.6.4 Kūhiō Beach Sector

Beach improvement and maintenance actions are proposed at both basins of the Kūhiō groin complex. In the Diamond Head (east) basin, the proposed action includes the addition of approximately 4,500 cy of sand between +5 and -4 ft MSL. No alterations to the existing structures are proposed. In the ʻEwa (west) basin, the proposed action includes the addition of approximately 26,000 cy of sand between +8 and -3 ft MSL, along with the construction of a segmented breakwater partially overlapping the existing 1939 “crib wall” and adjacent shore return structures.

The proposed work in the Diamond Head (east) basin, which consists of sand fill only, will occur makai of the ca. 1881 and ca. 1928 coastlines as depicted by Bishop (1881) and Kanahele (1928c), respectively. The location of Site 50-80-14-5948, a retaining wall thought to be the 1890 wall replacing the ca. 1880 bridge/causeway to Kapiʻolani Park, is approximately 27 m mauka of the Kūhiō Beach sector. The buried wall is beneath the seaward sidewalk of Kalākaua Avenue, so any intact archaeological deposits would lie inland of this wall and thus, under the roadway. While several archaeological sites, including burials, have been identified along Kalākaua Avenue near the Diamond Head (east) basin, the proposed action will be limited to an area of imported beach sand that likely post-dates the 1950s.

The proposed action in the ʻEwa (west) basin, which includes beach nourishment and construction of a segmented breakwater, will also occur makai of the ca. 1881 coastline and primarily seaward of the ca. 1928 coastline, although the sand fill area extends mauka of a "masonry wall" depicted on Kanahele's (1928c) map on the north side of the ʻEwa (west) basin.

The applicant will conduct periodic spot-check monitoring for the proposed beach maintenance action within the Diamond Head (east) basin since all work is within the post-late-19th century shoreline. The applicant will also conduct scheduled monitoring during ground-disturbing activities within the historical shorelines within the ʻEwa (west) basin. Given the presence of potentially significant existing beach infrastructure, including the Kapahulu storm drain/groin ("The Wall"), "Slippery Wall," the "crib wall," and the shore return structures on either side of the crib wall, the applicant will conduct historic preservation documentation and evaluations of the existing beach infrastructure prior to commencement of the proposed action. The applicant will also conduct formal consultations with the State Historic Preservation Division (SHPD) to further evaluate potential impacts of the proposed actions on historical, cultural, architectural, and archaeological resources, and possible measures to mitigate any potential adverse impacts.

9.3 Scenic and Aesthetic Resources

The gentle curve of the Waikīkī shoreline, the wide expanse of turquoise waters with multiple world-famous surf breaks, the changing colors resulting from the varying water depths and bottom types, and the picturesque backdrop of Diamond Head make the seaward and alongshore views from the shoreline spectacular. At the same time, the tall buildings that have been developed relatively close to the ocean along portions of the shoreline disrupt viewplanes from various perspectives. As a result, views inland from the shoreline are not one of the "significant panoramic views" identified in the City and County of Honolulu's Primary Urban Center Development Plan. The appearance of the beach is of significant interest to the resorts and commercial enterprises that operate in the project area, as their guests represent the most numerous and closest viewers. However, it is also of considerable interest to those who own and/or use adjacent areas and the walkway along Kalākaua Avenue.

Both residents and the tourist industry depend on Waikīkī's scenic resources. The beauty of its coastline draws millions of tourists to its sights and beaches each year. Map A-1 of the City and County of Honolulu's *Primary Urban Center Development Plan* identifies all of Waikīkī as being within a "Significant Panoramic View" zone. The *Waikīkī Special Design Guideline*'s Urban Design Control Map also identifies the area within which the access right-of-way and construction staging area are located as being within the Waikīkī Special Design district "Major View Corridor".

The City and County of Honolulu Land Use Ordinance (LUO) §9.80-3(a) designates some of the visual landmarks and significant vistas to be protected in the Waikīkī area, as:

- Views of Diamond Head from many vantage points,
- Continuous views of the ocean along Kalākaua Avenue from Kūhiō Beach to Kapahulu Avenue,