KAPĀLAMA CANAL CATALYTIC PROJECT

EXISTING CONDITIONS REPORT

OCTOBER 2016

Prepared by :

WCITARCHITECTURE

with assistance from:

ARUP

R. M. TOWILL CORPORATION
SINCE 1930

WILSON OKAMOTO
CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

walters kimura motoda
landscape architects

dtl

Table of Contents

1 Introduction
1.1 Project Background and Location ... 4
2 Site Analysis
2.1 General Observations ... 6
2.2 Nimitz Highway to Dillingham Boulevard ... 10
2.3 Dillingham Boulevard to North King Street ... 12
2.4 North King Street to the H-1 Freeway ... 15
2.5 The H-1 Freeway to Houghtailing Street ... 17
2.6 Bridges ... 18
2.7 Architecturally Significant Structures ... 20
3 Civil Study Areas
3.1 Flood Capacity and Channel Design ... 22
3.2 Utilities ... 23
3.3 Stormwater Runoff and Drainage ... 25
3.4 Water Quality and Pollutant Sources ... 26
3.5 Canal Management and Maintenance ... 26
3.6 Tides ... 27
3.7 Sea Level Rise and Climate Change ... 27
3.8 Bathymetric and Topographic Surveys ... 28
3.9 Design Standards ... 28
3.10 Ecology & Marine Resources ... 29
4 Related Planning Studies
4.1 Primary Urban Center Development Plan for 2025 ... 30
4.2 Kalihi-Palāma Action Plan ... 31
4.3 Kalihi Neighborhood Transit-Oriented Development Plan ... 33
4.4 Kapālama Canal: A Conceptual Plan Study ... 36
5 Jurisdiction, Land Ownership, and Regulations
5.1 Jurisdiction ... 37
5.2 Landowners ... 37
5.3 Landowner Development Plans ... 38
5.4 Revised Ordinances of Honolulu ... 39
5.5 Chapter 343 Hawai'i Revised Statutes ... 40
5.6 Land Use Considerations ... 41
5.7 Other Required Permits/Regulatory Approvals ... 42
6 Community Design ... 43
7 References ... 46
7.1 Civil References ... 47
Appendix A : Cultural and Historical Brief ... A-1
Appendix B : Community Stakeholders ... B-1
Appendix C : Geotechnical Work Plan ... C-1

1 Introduction

1.1 Project Background & Location

The Kapālama Canal Catalytic Project is based on various community plans supported by the City & County of Honolulu. These community plans include the Kalihi-Pālama Action Plan (2004)[4] and the Kalihi Neighborhood Transit-Oriented Development Plan (2014),[9] which provide visions for a linear park along Kapālama Canal, a waterfront promenade, and complete streets improvements along Kōkea and Kohou Streets from Nimitz Highway to the H-1 Freeway. In addition to supporting the community's visions, the Canal Project will address green infrastructure and water quality improvements, erosion control, bank stabilization, and dredging. The intent of the project is to catalyze broader neighborhood improvements and new mixed-use development in the area around the Kapālama rail transit station.

Kapālama Canal is an approximately one-mile long waterway in the ahupuaʻa of Kapālama that roughly follows the original course of the former Niuhelewai Stream from Honolulu Harbor to just diamond head of Houghtailing Street. The Canal was built by the City and County of Honolulu with financial assistance from the Federal Public Works Administration program in 1938 as a flood control project. While the flood protection allowed for the industrial, commercial, and residential developments currently on the adjacent lands, it regarded water as a nuisance, and the Canal was designed to drain water as quickly and as safely as possible, resulting in the degradation of water quality and stream bank erosion. The Kapālama Canal Catalytic Project seeks to elevate the perception of water from that of being a threat to that of being a community resource.

For the purposes of the Environmental Impact Statement that will be completed as part of this project, the study area is Kapālama Canal from Nimitz Highway to the first fork mauka of the H-1 Freeway. The study area of the Canal makai of Kalani Street will be limited to the outside edge of the Canal bank; between Kalani Street and the H-1 Freeway, the study area is defined from property line to property line, and between the H-1 Freeway and the first fork, the study area will be limited to the inside edges of the Canal *(Fig. 1-1)*. Although outside of the project area, the project context as shown in the dashed line in Fig. 1-1 will be discussed throughout the report to facilitate more comprehensive neighborhood planning.

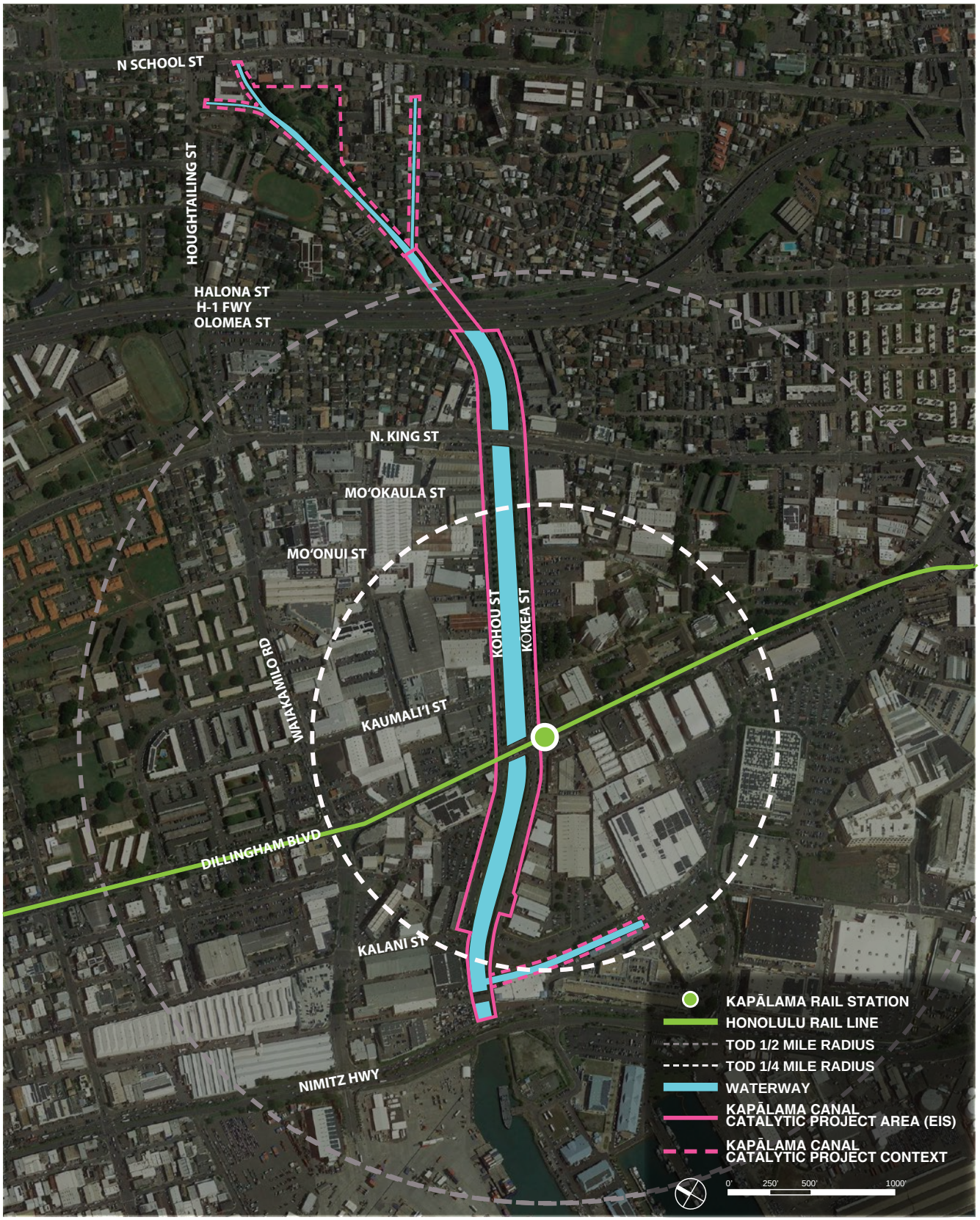


Fig. 1-1 Kapālama Canal Catalytic Project Area

2 Site Analysis

2.1 General Observations

2.1.2 Water

Kapālama Canal runs in a southeast direction for one mile from Houghtailing Street to Honolulu Harbor within the Kapālama Canal watershed. The watershed extends mauka from Honolulu Harbor for approximately fives miles to the top of the Koʻolau Mountain Range, and encompasses an area of approximately one-half mile on both sides of the canal.[1] The water of the canal itself is murky and appears to be a dumping ground for old bicycles and shopping carts. In 2015, the City installed a four-foot high fence to restrict access and to prevent dumping of debris into the waterway from the portion of the Canal between Kalani Street up to Olomea Street. However, there still appears to be a trash problem not just in the waterway but in and around the stream banks and streets as well. Issues relating to sedimentation, contamination by pollutants and fecal matter, and erosion (observed particularly around exposed stormwater outfalls) have also been noted, as has the presence of fish and crab in certain areas, and will be studied further as part of the Canal Project.

Fig. 2-1 Canal mauka of H-1 Freeway looking makai

Fig. 2-2 Canal makai of H-1 Freeway looking makai

From Honolulu Harbor to Halona Street just mauka of the H-1 freeway, water levels are affected by tidal movement, indicating that varying salinities of brackish water flow through the canal up to North King Street. While the ground surface of the canal up to the H-1 freeway is a mixture of soft to stiff brown clayey silt, sand, and coral,[1] the canal is a concrete channel that is relatively dry on most days from H-1 to Houghtailing Street. Untreated stormwater and surface water from the surrounding properties and roads flow directly into the canal and via stormwater overflows that enter directly into the canal. Should proposals be made to alter the waterway, hydraulic modelling (currently not in Canal Project scope) of the existing canal and planned improvements is recommended to ensure that the flood control goals will be met for present and future needs.

Fig. 2-3 Canal fence

2.1.2 Climate

Prevailing tradewinds blow from the northeast at an average of 14 mph, and Kona winds blow from the southwest. Rainfall averages 20 inches per year near Kapālama Basin and 30 inches at Kapālama Heights.

Fig. 2-4 Typical stormwater outlets

Fig. 2-5 Rainbow shower trees

Fig. 2-6 Sidewalk uplift near rainbow shower tree

Fig. 2-7 True kamani trees along Dillingham Boulevard

Temperatures range from 65°-85°F with an annual mean of 75°F. Relative humidity averages 60-65%.[2]

2.1.3 Topography

The land within the study area is relatively flat, with a gentle slope upward in the mauka direction from an elevation of approximately 5 feet at the old railroad bridge near Nimitz Highway, to about 10 feet at North King Street. The ground continues to slope to an elevation of about 45 feet at Houghtailing Street. [1]

2.1.4 Vegetation

Vegetation in the project area consists mainly of grass and weeds adjacent to the roads, pickleweed and mangroves along the stream banks, and rainbow shower street trees. Pickleweed (*Batis maritama*) is an introduced species common along Hawaiian coastal areas as it tolerates brackish water. Mangrove is another introduced species found along the Canal banks. While it can contribute to the improved quality of offshore waters due to sediment retention, it can also trap high amounts of litter, reduce habitat quality for native waterbirds, provide shelter for waterbird predators, out-compete native plants, and limit tidal flushing by blocking channels and restricting the exchange of water.

Besides the rainbow shower street trees along portions of the Canal, few landscaping and planting improvements have been made. Street trees in Honolulu are typically pruned every 1-2 years and recent pruning occurred in late June/early July of 2016. Sidewalk uplifting has been noted in certain areas along the Canal. Some of the trees have poor branching habits and wounds and should be reviewed by a certified arborist prior to implementation of any improvements. Existing street trees provide little shade, and planting shade trees should be considered as pedestrian access along the Canal is considered.

Although not part of the direct project area, 43 true

kamani trees are found along both sides of Dillingham Boulevard between Kōkea and Kaʻaahi Streets that will be affected by the Honolulu Rail Transit project. These trees are considered "notable" due to their importance to the urban landscape character.

According to the Honolulu High-Capacity Transit Corridor Project Environmental Impact Statement, 28 trees on the makai side of Dillingham Boulevard will be removed. Further, the draft Section 106 Programmatic Agreement (PA) in Appendix H states, "The City will replace true kamani trees within the corridor as close as feasible to the current location of the group of 28 true kamani trees on the makai side of Dillingham Boulevard that will be removed…new plantings will provide similar advantages to the community. If new plantings do not provide "equitable mitigation" (i.e. older mature trees like those that are being removed), additional younger trees will be planted that will, in time, develop similar benefits."[3]

Due to the project's proximity to the location of the true kamani trees, the City is considering Kapālama Canal as a potential site for replacement plantings.

Fig. 2-8 Remote control valves and plastic and brass sprinklerheads

Fig. 2-9 Drinking fountains

2.1.5 Irrigation

Two double check valves, serving an irrigation system, are located along Kohou Street; one is makai of Dillingham Boulevard, and the other is between Dillingham Boulevard and North King Street. Two remote control valves are noted adjacent to the more makai double check valve, but no automatic irrigation controller is evident. A combination of brass and plastic sprinkler heads is visible along the curb. Brass sprinkler heads indicate an older irrigation system. According to the City, there is an operational existing irrigation system that was installed as part of a Department of Parks and Recreation beautification project that also included the installation of trees, park benches, pergolas, drinking fountains, and grass.

The existing double-check valves would need to be replaced with reduced-pressure principle backflow preventors to meet the Uniform Plumbing Code. New and renovated portions of the existing irrigation system also have the opportunity to incorporate water-efficient devices to minimize irrigation water demand.

2.1.6 Existing Amenities

Photos from 2015 indicate benches on concrete pads facing Kapālama Canal and pergolas along Kohou Street, which have since been removed. Two drinking fountains are located outside the chain link fence along Kohou Street makai of Dillingham Boulevard; one is not operational.

2.1.7 Multi-Modal Connectivity

Kohou and Kōkea Streets are two-lane, two-way streets with continuous vehicular access from Kalani Street to Olomea Street. Concrete sidewalks provide continuous pedestrian access on the non-Canal side of both streets, except in the street shoulder fronting Honolulu Community College (HCC) where there is a compacted dirt/gravel surface used for parking. On the Canal side of both Kohou and Kōkea Streets, a concrete sidewalk exists only in the section between Olomea Street and North King Street, with the remainder of the Canal surfaced with landscaping or compacted dirt surfaces, much of which is fenced off for public safety and to minimize access that may cause increased erosion of the unprotected stream bank. Crosswalks are provided at each bridge crossing but are deficient in that they do not provide direct access along the Canal. Limited pedestrian activity has been observed along the Canal. No vehicular or pedestrian path connects the Kohou and Kōkea Streets to Nimitz Highway and the Pier 38/39 Fishing Village, nor is there public access adjacent to the Canal mauka of the H-1 Freeway. To access Nimitz Highway from Kohou and Kōkea Street, , both vehicles and pedestrians must route through Waiakamilo Road or Alakawa Street, and to access the area mauka of the H-1 freeway, vehicles and pedestrians can connect through Pālama or Houghtailing Street. Should the City desire to directly connect the Canal to the Harbor and/or the area mauka of H-1, multi-modal/pedestrian footbridges could be considered over Nimitz Highway and the H-1 Freeway.

No bicycle paths exist along the Canal, but a dedicated bike lane does cross the Canal along Nimitz Highway in both the 'ewa and diamond head directions. The Kalihi Neighborhood Transit-Oriented Development Plan[9] proposes the addition of bike lanes along Dillingham and North King Street and the conversion of Kohou and Kōkea Streets into bicycle and pedestrian oriented promenades.

No bus routes run along the Canal, but bus routes run in the ʻewa and diamond head directions along Nimitz Highway, Dillingham Boulevard, and North King Street. The Dillingham and North King bus routes stop at both Kohou and Kōkea Streets.

The future Honolulu rail line will run along Dillingham Boulevard. The Kapālama rail station will be located at the intersection of Dillingham and Kōkea, with entrances on both mauka and makai sides, and a Handi-Van pick up/drop-off area on the mauka side. The main entrance will be designed for the mauka side of Dillingham and integrated as a transit plaza within Honolulu Community College's campus plan, suggesting the importance of this intersection along the Canal as an active multi-modal hub accessible to pedestrian, bicycle,, and vehicular traffic.

2.1.8 Canal Study Areas

The character of the Canal and adjacent land varies noticeably between bridge crossings, suggesting an opportunity to diversify Canal improvements and user experiences at each section based on existing conditions and adjacent land uses. Sections 2.2 to 2.5 provide visual and verbal descriptions of the Canal's characteristics at its various sections - from Nimitz Highway to Dillingham Boulevard, Dillingham to North King Street, North King to the H-1 Freeway, and H-1 to Houghtailing Street - alongside aerial maps and diagrammatic sections with approximate dimensions.

2.2 Nimitz Highway to Dillingham Boulevard

2.2.1 Aerial Map and Sections

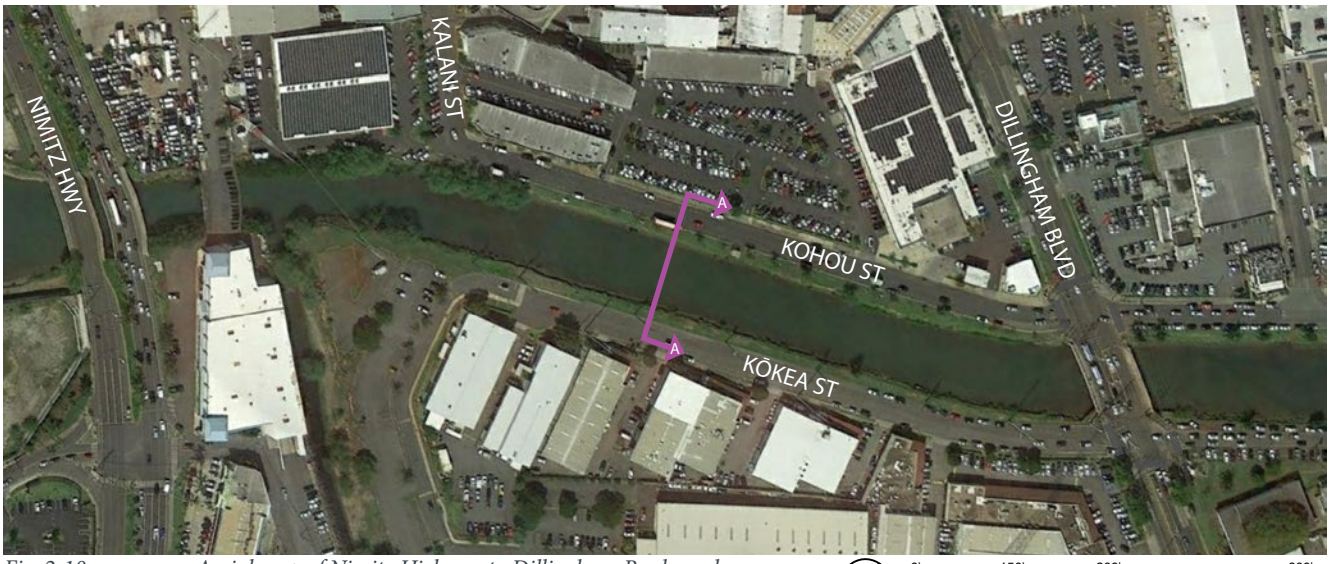


Fig. 2-10 *Aerial map of Nimitz Highway to Dillingham Boulevard*

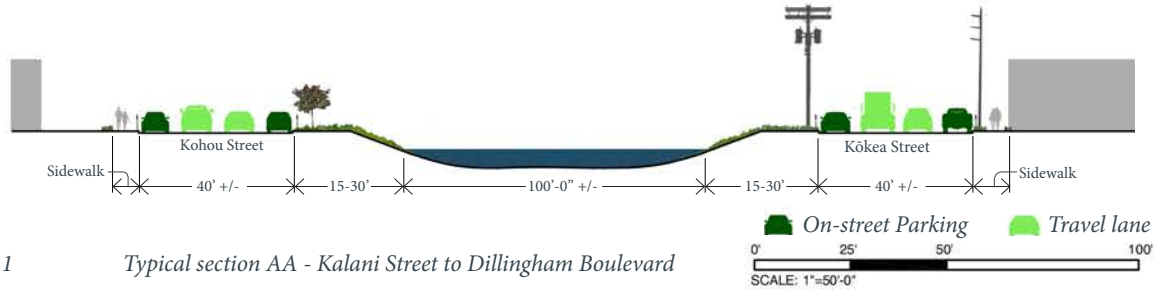


Fig. 2-11 *Typical section AA - Kalani Street to Dillingham Boulevard*

Fig. 2-11a *Enlarged Kohou Street section*

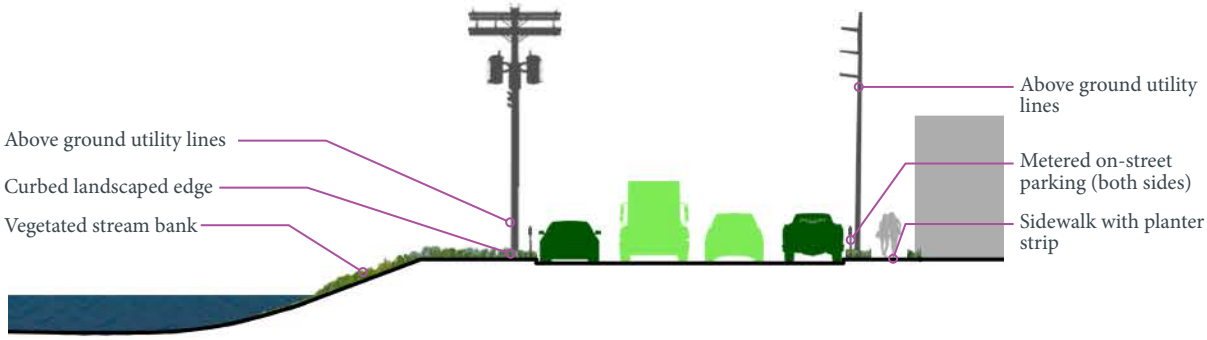


Fig. 2-11b *Enlarged Kōkea Street section*

2.2.2 Observations

The section from Nimitz Highway to Dillingham Boulevard has a graded soil embankment that is approximately 5' high with grasses and natural covering. Honolulu Harbor at the mouth of the Canal is likely a source of industrial and shipping related pollutants, including oil and petroleum contaminants. The Sand Island Treatment Plant is also located within the harbor; however, the treated effluent outfall is located miles offshore and unlikely to have any impact on the Canal. Just mauka of Nimitz Highway, a portion of the old Oʻahu Rail and Land Company (ORLC) bridge crosses the Canal. The bridge is privately owned and used for storage. The water below appears to be very dirty, with a lot of floating debris possibly due to the bridge acting as a chokepoint for flow leaving the Canal into the harbor. At high tide this debris is washed back upstream into the Canal. Just mauka of the old bridge, a drainage channel from Iwilei, south of Dillingham Boulevard flows into the Canal. A private water pump system increases the flood capacity of the gravity flow system, but the system's inadequacy creates flooding problems in Iwilei. A fenced-off footbridge crosses over the drainage channel that once housed a squatter structure which has recently burned down. In addition to the Iwilei drain, this section of also receives stormwater runoff from the surrounding area through three main drains; one in Kalani Street, and two from either side of Dillingham Boulevard.

Fig. 2-12 Canal mauka of old ORLC bridge looking makai

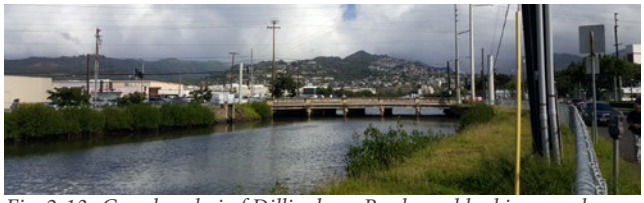


Fig. 2-13 Canal makai of Dillingham Boulevard looking mauka

Fig. 2-14 Kōkea Street looking makai

Fig. 2-15 Kohou Street looking makai

Fig. 2-16 Iwilei drainage channel

Fig. 2-17 Iwilei drainage channel footbridge

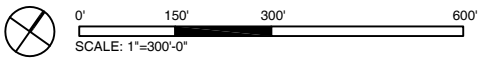
Further upstream of Nimitz Highway, mangrove and kiawe trees are prominent along the stream banks up to Kalani Street, blocking visual and physical access to the Canal. Mauka of Kalani Street, along Kohou Street, are rainbow shower trees (with an irrigation system), and along Kōkea Street no trees or irrigation system exist.

Both Kohou and Kōkea Streets dead end mauka of the old ORLC bridge, and neither streets have sidewalks immediately along the Canal. Both streets have metered on-street parking on either sides; a curbed, grassy dirt area separates the streets from the Canal banks; and above ground utility lines run on both sides of Kōkea Street. Neighborhood destinations along Kohou Street include Chinatown Market Place and City Square Center. Kōkea Center is located on Kōkea Street.

2.3 Dillingham Boulevard to North King Street

2.3.1 Aerial Map and Sections

Fig. 2-18 Aerial map of Dillingham Boulevard to North King Street



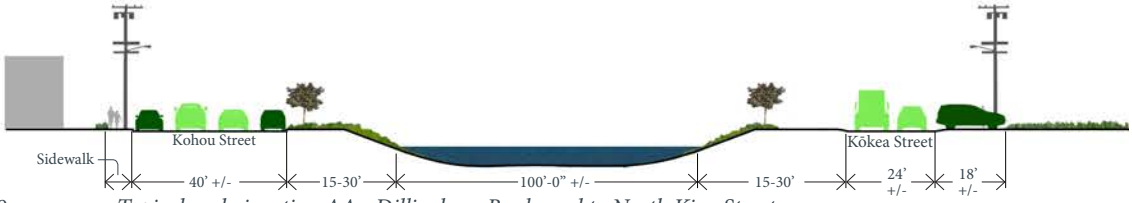


Fig. 2-19 Typical makai section AA - Dillingham Boulevard to North King Street

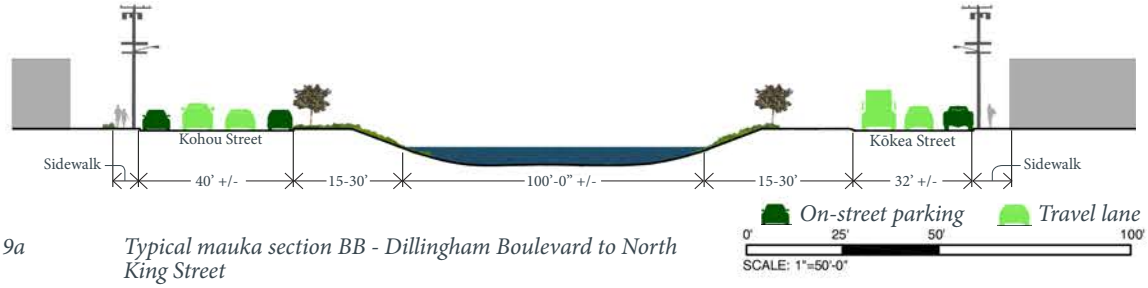


Fig. 2-19a Typical mauka section BB - Dillingham Boulevard to North King Street

Fig 2-19b Enlarged Kohou Street section

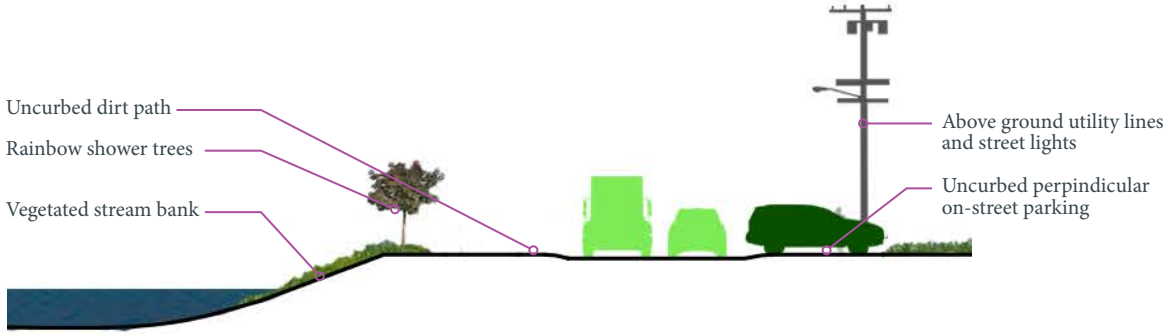


Fig 2-19b *Enlarged Kōkea Street makai section*

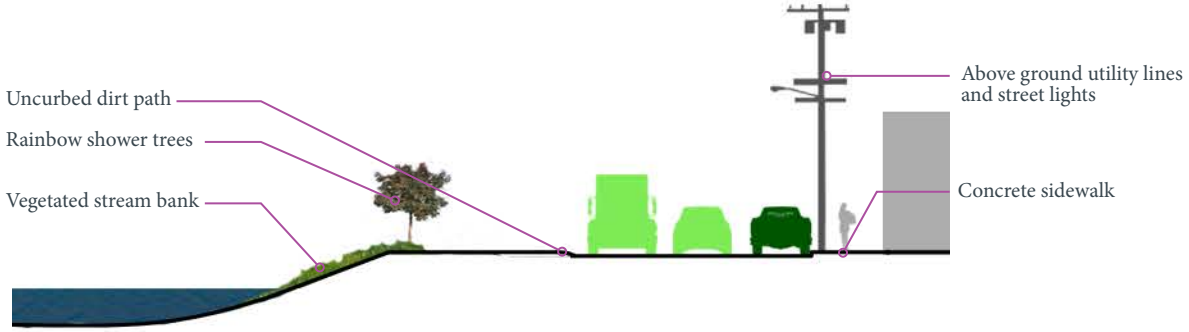


Fig 2-19c *Enlarged Kōkea Street mauka section*

On-street parking *Travel lane*

2.3.2 Observations

The quarter-mile stretch of Kapālama Canal between Dillingham Boulevard and North King Street has graded soil embankments approximately 5' high with grasses and natural coverings, a few mangroves, a concentration of weeds including haole koa, and evenly spaced rainbow shower trees on either side, with a higher density along Kohou Street. There is an irrigation system along Kohou Street with a backflow preventer, but no irrigation system along Kōkea Street. This section of the Canal has a number of stormwater drainage outlets from the surrounding area, including from the Honolulu Community College, the adjacent former Incinerator site, the majority of the commercial area between Dillingham Boulevard and North King Street, and the area around King David Kalakaua Middle School.

Fig. 2-20 Kōkea Street looking mauka

Fig. 2-21 Kohou Street looking makai

Fig. 2-22 HCC gathering space

Fig. 2-23 Kōkea Street looking makai

Fig. 2-24 Kohou Street looking makai

On Kōkea Street, an uncurbed compacted dirt/gravel surface once used for parking along the Canal but has since been fenced off, with the uncurbed condition likely draining stormwater directly into the Canal. On the ʻewa side of Kōkea Street is a concrete sidewalk and un-metered on-street parking on the mauka portion while on the makai half, an uncurbed compacted dirt/gravel surface is used for perpindicular parking in the right of way fronting Honolulu Community College (HCC). Unmetered on-street parallel parking exists on both sides of Kohou Street, and a curbed landscaped area separates the Canal from the street. Above ground utility lines and street lights run on the non-Canal sides of Kohou and Kōkea Streets.

Honolulu Community College is a significant landowner in this portion of the Canal - its community of students and its campus design of activated outdoor spaces make the corner of Dillingham and Kōkea a major node of activity along the Canal. The Kapālama Shopping Center, also located at the corner of Dillingham Boulevard and Kohou Street, and the proposed location of the future rail station on HCC's campus suggest that the intersection of the Canal at Dillingham has the potential of becoming a highly trafficked community gathering space.

Aside from these neighborhood destinations, industrial land use is prominent in the area. The former Incinerator site on the mauka-ʻewa corner of HCC's campus is also located in this section. An open drainage ditch runs along the mauka edge of the old Incinerator site and drains into the Canal.

2.4 North King Street to the H-1 Freeway

2.4.1 Aerial Map and Sections

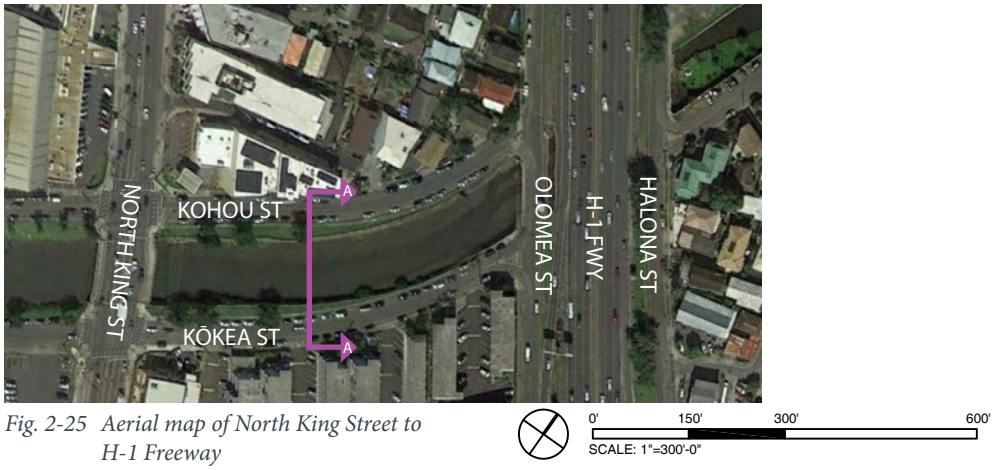


Fig. 2-25 Aerial map of North King Street to H-1 Freeway

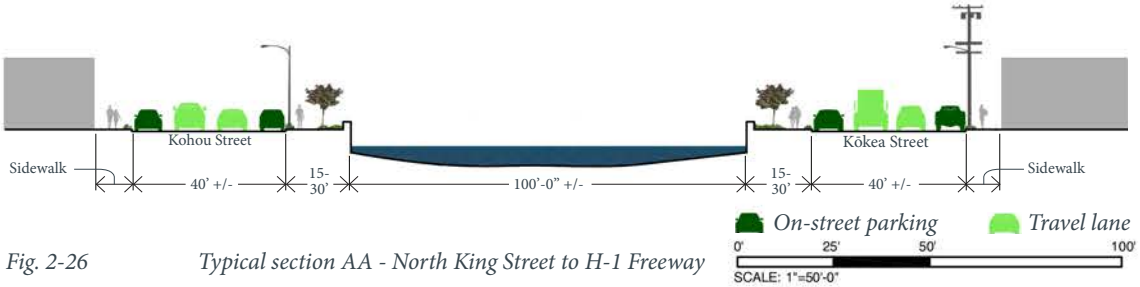


Fig. 2-26 Typical section AA - North King Street to H-1 Freeway

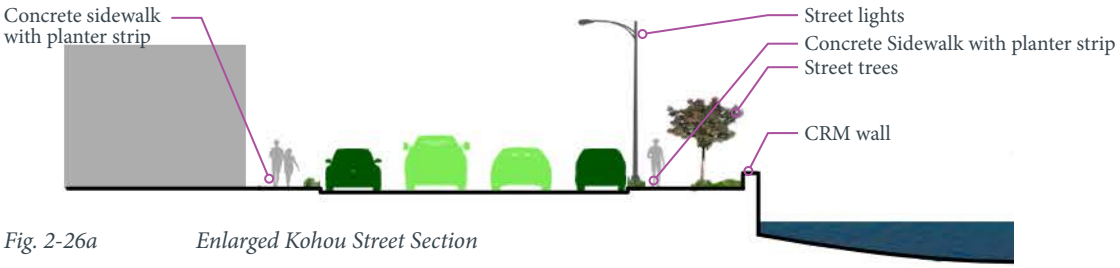


Fig. 2-26a Enlarged Kohou Street Section

Fig. 2-26b Enlarged Kōkea Street section

2.4.2 Observations

Upstream of North King Street, the Canal edges are vertically lined with concrete rubble masonry (CRM) walls standing roughly 10' high and extending approximately 1-2' above adjacent grade, atop of which sits a chain link fence. The area around North King Street appears to be where the water begins to transition between the tidal salt water and fresh water, and there appears to be a large build-up of sediment. Volunteer banyan trees and autograph trees are found growing on the vertical portions of the CRM walls, with pickleweed and mangroves growing in the sediment areas. This section of the Canal receives significant stormwater runoff from the H-1 Freeway, as well as stormwater from the surrounding residential areas.

Both sides of Kohou and Kōkea Streets are lined with unmetered on-street parking, and 4'-wide concrete sidewalks provide pedestrian accessibility immediately above the water's edge. The sidewalks on the Canal side are bounded by landscaped areas that decrease in width approaching Olomea Street, with evenly spaced trees (large rainbow showers trees and "Queen's Hospital White" shower trees near North King Street), an irrigation system, and a curbed street edge.[1] On Kōkea Street, above ground utility lines and street lights run along the diamond head side. Kohou Street has street lights on the Canal side.

The land adjacent to this area is primarily privately owned single- and multi-family residential, presenting an opportunity for recreational and park improvements along the Canal for area residents and families to enjoy.

Fig. 2-27 Canal looking makai from Olomea Street bridge

Fig. 2-28 Kōkea Street looking mauka

Fig. 2-29 Kōkea Street looking mauka

Fig. 2-30 Kohou Street looking mauka

Fig. 2-31 Kōkea Street looking makai

Fig. 2-32 CRM wall with volunteer trees

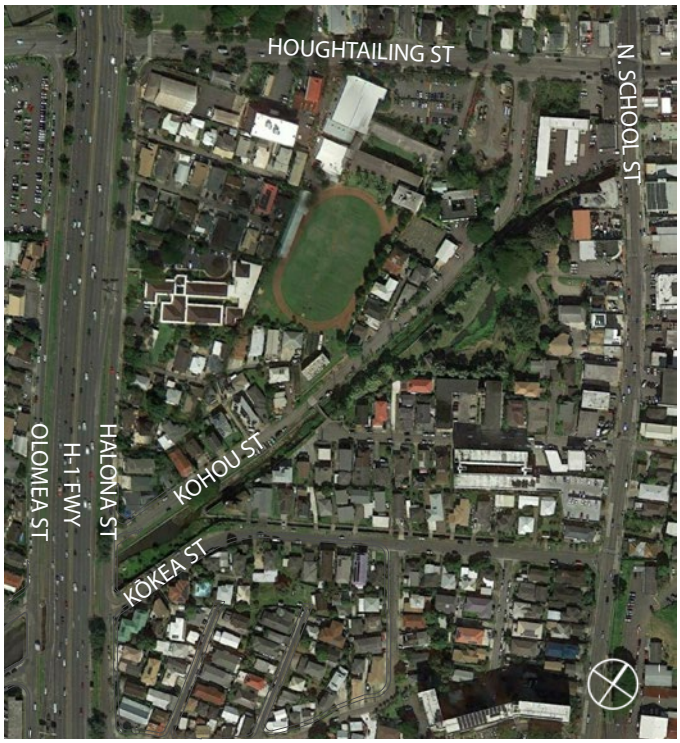


Fig. 2-34 Aerial map of Canal from H-1 to Houghtailing Street

Fig. 2-35 Canal fork

Fig. 2-36 Private driveways over Canal

Fig. 2-37 Footbridge over Canal

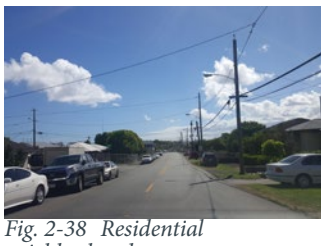


Fig. 2-38 Residential neighborhood

Fig. 2-39 Loʻi Kalo Park

2.5 The H-1 Freeway to Houghtailing Street

While the area between the H-1 Freeway and the first Canal fork is part of the project area, the area mauka of the Canal fork is not part of the scope of the Canal Project. However, a cursory understanding of the overall area is important to designing a cohesive and connected amenity for the community.

2.5.1 Observations

Mauka of the H-1 Freeway, Kapālama Canal is contained in concrete channels with CRM walls. Immediately upstream of the H-1 Freeway, the Canal splits into two concrete-lined channels where there appears to be a large concentration of fish. The Canal splits again further upstream into smaller concrete-lined channels. The houses along Kōkea Street in this area have driveways that cross directly over the Canal.

The land adjacent to this portion of the Canal is primarily low density residential, with Loʻi Kalo Park and Damien Memorial School just diamond head of Houghtailing Street.

Loʻi Kalo Park, also known as "Fat Man Park" is owned by the Board of Water Supply. In 1999, the community group Nā Hoaloha o Loʻi Kalo Park adopted the park. Today, the park is underutilized and under-maintained. Built structures include an open air pavillion, an inactive pump station, and a small parking lot. The park is cut off from the surrounding neighborhood, with an unassuming unlocked gated entrance for public access at the back of a parking lot off North School Street, and a locked maintenance entry gate on the mauka/diamond head end.

2.6 Bridges

Five operational bridges cross Kapālama Canal in the project area - Dillingham Boulevard, North King Street, Olomea Street, the H-1 Freeway, and Halona Street. The Nimitz Highway bridge is just outside the project area on the makai end. As mentioned in Section 2.3, the obsolete ORLC bridge crosses the Canal close to Nimitz Highway. Low waterway clearances are characteristic of all aforementioned bridges, limiting opportunities for continuous navigational and recreational circulation along the length of the Canal.

2.6.1 Dillingham Bridge

Built in 1930, the Dillingham Bridge is owned and maintained by the City and is eligible for nomination to the National Historic Register. The bridge is a two-way street with two lanes and a turning lane in each direction, 10' sidewalks on both sides, and above ground utility lines on both sides. The Honolulu Authority for Rapid Transit (HART) proposes to extend the bridge 20' in the makai direction to accomodate the rail's guideway columns for a transit station that will touch down on the mauka and makai sides of Dillingham Boulevard at Kōkea Street.[3] Crosswalks provide pedestrian access from the 'ewa side of Kohou Street to the diamond head side of Kōkea Street on both the mauka and makai sides of the Dillingham bridge, and across Dillingham Boulevard on the diamond head side of the intersection. No mauka-makai crosswalks on either side of the Canal exist.

Fig. 2-40 Nimitz Highway

Fig. 2-41 Dillingham Bridge

2.6.2 North King Street Bridge

The North King Street bridge was constructed in 1938 and is owned and maintained by City. The bridge is a concrete T-beam structure with concrete balustrades and metal railings that show significant rusting. Above ground electrical lines and character lighting typical along North King Street continues along both sides of the bridge. Crosswalks provide pedestrian access from the 'ewa side of Kohou Street to the diamond head side of Kōkea Street on both the mauka and makai sides of the bridge, and across North King Street on the non-Canal side of the bridge. No mauka-makai crosswalk on the Canal side exists.

Fig. 2-42 North King Street Bridge

Fig. 2-43 Olomea Street Bridge

Fig. 2-44 H-1 Freeway/Olomea Street Bridge

Fig. 2-45 Halona Street Bridge

2.6.3 Olomea Street, the H-1 Freeway, and Halona Street Bridges

The Olomea Street Bridge, just makai of the H-1 Freeway, was constructed in 1965 and is a two-lane east-bound bridge with a sidewalk, crosswalks, and street lights on the makai side. The Halona Street Bridge just mauka of the H-1 Freeway was built in 1938 and is a two-lane west-bound bridge with a sidewalk, crosswalks, and street lights on the mauka side. Plans are underway to improve the bridge's mobility for highway users, address existing structural deficiences, and meet current design standards for roadway width, load capacity, pedestrian and bicycle traffic, bridge railing and transitions, and bridge approaches.[5] The H-1 Freeway is an eight-lane highway. The Olomea Street, Halona Street, and the H-1 Freeway Bridges are under the jurisdiction of the State of Hawai'i HDOT.

Should a connection between the mauka and makai areas of the H-1 Freeway be desired, a footbridge over these three bridges may be considered. The potential for a pedestrian/bicycle underpass may also be explored as it appears there may be enough clearance.

2.7 Architecturally Significant Structures

A variety of architecturally significant buildings and landscape features exist along or near Kapālama Canal. Based on cursory architectural observations, HART studies, and the Kalihi-Pālama Action Plan, notable structures and landscape features immediately along or adjacent to the Canal include the Dillingham Bridge, the Oʻahu Rail and Land Company Bridge, the Hawaiʻi Hochi building, the Incinerator site, and the true kamani trees along Dillingham Boulevard diamond head of the Canal. There are currently no structures in the project area that are listed on the National Historic Register nor the Hawaii Register of Historic Places. The Archaeological Inventory Survey that will be conducted as part of the Catalytic Project will explore the topic in more detail.

2.7.1 National Historic Register Eligible

Constructed in 1930, the Dillingham Bridge is eligible for nomination to the National Historic Register. The bridge is a five-span, reinforced concrete, tee-beam deck-girder bridge with 10' sidewalks on both sides. Built for the City as a transportation link between Kalihi and downtown Honolulu, the bridge is historically significant for its association with the transportation history of the area and as an example of concrete bridge engineering and design.[4] The mature true kamani trees just diamond head of Kapālama Canal along Dillingham Boulevard are also eligible for nomination to the National Historic Register. The trees were planted along both sides of Dillingham Boulevard around 1934, with a typical spacing of 55 to 75 feet, and is notable for its association with the 1930s development of Dillingham Boulevard and distinctive characteristics of 1930s street landscaping.[6]

Fig. 2-45 Dillingham bridge

Fig. 2-46 Hawaiʻi Hochi building

Fig. 2-47 True kamani trees

2.7.2 Other Architecturally Significant Structures

The old ORLC bridge just mauka of Nimitz Highway was built sometime between 1890 and 1921 and is a remnant of the transportation system that linked Honolulu Harbor to 'Ewa through World War II. Kapālama Incinerator was built in 1947, was shut down by the EPA in 1977, and was demolished in 1997, leaving a contaminated parcel with high levels of lead and other heavy metals. Today the parcel is a surface parking lot owned by the State of Hawaii Department of Land and Natural Resources (DLNR).
The Hawaiʻi Hochi building on Kōkea Street is noteable for its Brutalist style and its architect, Pritzker prize winner Kenzo Tange.

Fig. 2-48 Old Incinerator site

Fig. 2-49 Old Oʻahu Land & Rail Co. bridge

Fig. 2-50 Pālama Fire Station

2.7.3 Nearby Historically Significant Structures

Nearby but not immediately adjacent to the Canal exist several other significant buildings, including the six quonset huts at 1001 Dillingham Boulevard which were identified as eligible for nomination to the National Historic Register by HART, and Pālama Fire Station and Kaumakapili Church which are noted in the Kalihi-Pālama Action Plan for their listing on the National Historic Register.

Fig. 2-51 Location of significant buildings and sites: 1. Dillingham Bridge, 2. Former Incinerator site, 3. Hawai'i Hochi building, 4. True kamani trees, 5. Six quonset huts, 6. Pālama fire station, 7. Kaumakapili Church

3 Civil Study Areas

The data reviewed in this Existing Conditions Report represents a snapshot of the materials and information currently available for the Kapālama Canal and immediate vicinity. As the design progresses and input is gathered from various stakeholders, including the City, Kamehameha Schools, and the surrounding community, additional data or information may be acquired and requested.

3.1 Flood Capacity and Channel Design

The flood capacity and channel design of the existing Kapālama Canal will help to determine how the proposed Kapālama Canal improvements should be designed. Any Canal improvements should improve flood capacity, or at a minimum avoid exacerbating flood conditions. Flooding issues decrease neighborhood quality and property values, and the potential flooding effects of the project would likely affect the public and community support for Canal improvements.

Should the Canal be determined to be sufficiently-sized to protect against flooding as is, then modifications that meet or exceed this capacity may be considered as design alternatives. Should the Canal be oversized, then designs that reduce its capacity may be considered. Should the Canal be undersized, then efforts should be made to increase the capacity through design and Canal modifications.

Hydraulic modeling,currently not in the scope of the Catalytic Project is recommended to validate the existing flood capacity and verify the effects the proposed design would have on flood capacity, ideally taking into account future conditions such as sea level rise and climate change. This modeling effort would ensure a no-worsening condition for the final design.

Based on these results, the amount of the project area devoted to Canal improvements versus. bank improvements may shift or be refined, as well as the depth and width of the water channel within the extents of the Canal.

Partner agencies and critical stakeholders for this design component include: United States Army Corps of Engineers (USACE); Federal Emergency Management Agency (FEMA); University of Hawaiʻi Sea Grant College Program (Hawai'i Sea Grant); City Department of Planning and Permitting (DPP); Honolulu Land Information System (HoLIS), Data Access and Imaging Branch (DAIB), Permit Issuance Branch (PIB); City Department of Facility Maintenance (DFM), and City Department of Design and Construction (DDC). Note the HoLIS Flood Hazard Assessment Tool also includes FEMA's Flood Insurance Rate Maps (FIRMs).

Collected materials and data of significance to this design component include: area drainage maps with flows, FIRM map, and channel design reports.

Additional data requested or to be gathered from stakeholders include: Canal hydrologic/hydraulic models, flood models [possible sources may include the City, FEMA, Honolulu Community College (HCC), and/or University of Hawaiʻi (UH)], and existing flooding issues from residents and businesses in the area.

3.2 Utilities

The location of utilities within the project area could have a significant impact on the costs and agency/stakeholder coordination required for the Canal improvements. Additionally, if the project design conflicts with existing utilities, this could create issues between stakeholder agencies and affect support of the project from the utility agencies/stakeholders, unless improvements are planned to mutually benefit utility agencies, affected stakeholders, and Canal improvements. Underground utilities are likely to have the largest impact on the cost of the project and on the placement of the design features, while aboveground utilities will have the largest impact on the overall look and feel of the Canal area.

If conflicts between the Canal improvement design and utilities cannot be avoided, then the utilities may need to be moved or protected. Priority should be given to resolving utility conflicts that will incur significant cost or construction impacts to the project, such as having to relocate a water line.

In order to minimize design and construction issues, it is important to identify the locations and types of utilities early on in the design process and mitigate conflict where possible, as appropriate or required. The location of the existing utilities will likely affect the placement of the Canal improvements and features, including any green infrastructure features.

These utilities will include pipelines and infrastructure associated with water, sewer, stormwater, gas, electric, and communications. As-builts, record drawings, and surveys supplied by the appropriate agencies will help the design team to identify the locations of these various utility types.

As-built information indicates a number of existing underground utilities on Kōkea Street and Kohou Street including sanitary sewers and water mains. In addition,there are numerous existing water and gas mains and sanitary sewers that cross the Canal in the vicinity of the King Street and Dillingham Boulevard bridges. It would appear from the as-built drawings received from DPP that these utilities are running within the structure of the bridges, some of which have been laid under the invert of the Canal, including a 36-inch diameter sewer at Dillingham Boulevard. Fig. 3-1 shows the locations of the existing utility lines for storm, sewer, water, and gas. Additional information is still required to determine the locations of the electrical and communications lines.

From a cost standpoint, the areas where there are no or minimal utilities will likely be the sites that the project will want to utilize if significant improvement work is to be performed. For example, on Kohou Street between Nimitz Highway and Dillingham Boulevard and on Kōkea Street between Dillingham Boulevard and North King Street there are almost no utilities that run along the canal, except for a number of storm drain outlets. All else being equal, these would be good locations along the canal for improvements. Additionally, on Kohou Street between North King Street and the H-1 Freeway, there is a sewer line which runs along the canal and a portion of the waterline; doing work on this side of the canal however would be preferable to doing work on the other side of the canal since Kōkea Street has both a water line and a sewer line running along it. The stretch of Kohou Street between Dillingham Bouleavard and North King Street would likely be the most difficult and costly to do work on

Fig. 3-1 Utility map

because there are storm, sewer, water, and gas lines running along the canal here.

Partner agencies and critical stakeholders for this design component include: Honolulu Board of Water Supply (BWS), Hawaiian Electric Company (HECO), Hawaiʻi Gas, Hawaiian Telcom (HTel), City DPP, and City Department of Environmental Services (DES).

Collected materials and data of significance to this design component include: existing storm drain, sewer line, and water line maps and DPP record drawings and as-builts.

Additional data requested or to be gathered from stakeholders include: maps for HECO, HTel, and Hawaiʻi Gas utilities.

3.3 Stormwater Runoff and Drainage

The amount of stormwater entering the Canal via surface flow compared to the amount entering through the stormwater system outfalls will help to determine the sizing requirements of any green infrastructure components and the stormwater capacity needs of the channel.

The location of the stormwater outfalls will help inform the design of the Canal's bank and edge treatments. Additionally, the edge treatment designs and features are an opportunity to make the existing outfalls less visible and more aesthetically pleasing. Any changes to the Canal banks or edges will need to account for the flow coming out of the stormwater outfalls and ensure that the flow will not be impeded in any way.

In order to drain stormwater off the streets as quickly, effectively, and safely as possible, it is important that the design not cause backups into the stormwater system. Flows from the surrounding neighborhoods will continue to be conveyed into the Canal through existing stormwater outfalls, while surfaces flows from the surrounding impervious areas could be sent into green infrastructure features before the water reaches the Canal. Green infrastructure features along the edge of the Canal would capture surface flows, providing preliminary treatment, pollutant removal (e.g., removing cigarette butts and motor oil), and water quality benefits. Additional green infrastructure features could help to reduce peak stormwater flows into the Canal as well.

Partner agencies and critical stakeholders for this design component include: City Department of Facility Maintenance (DFM) and City DPP Civil Engineering Branch (CEB), City DDC, and PIB.

Collected materials and data of significance to this design component include: United States Geological Survey (USGS) drainage maps and hydrology/hydraulic reports.

Additional data requested or to be gathered from stakeholders include: drainage models.

Fig. 3-2 Stormwater outfalls map

3.4 Water Quality and Pollutant Sources

By identifying the pollutant sources most significantly affecting the Canal and the Canal's water quality, Canal improvements can be designed to help mitigate these environmental and water quality issues. As source pollutants are decreased, water quality will improve, resulting in the enjoyment of the Canal by the surrounding community, and improved habitats for animals and plants. For example, given the high trash and sediment load in the Canal, trash racks could be installed in green infrastructure planters, and the shape of the Canal could be altered to promote sediment deposition to more preferred areas within the Canal. In addition to the physical Canal improvements, increasing the beneficial uses along the Canal through programming and neighborhood improvements will help to reduce direct pollutant sources, such as trash. These improvements together would help to reduce the amount of motor oil, cigarettes, dumped materials, and general trash and debris that end up in the Canal.

Additionally, non-point source loading via surface stormwater runoff from the surrounding roads and highways could be sent through green infrastructure features and treated before entering the Canal, which would help to reduce pollutants loading into the Canal. The stormwater overflows that enter directly into the Canal also present an opportunity to enhance water quality. For example, an educational signage program could be implemented in the surrounding community, labeling the storm drains with "Drains to Canal / Ocean" to remind residents to not dump anything into the storm drain.

The Incinerator previously on the HCC parking lot site also represents a potentially significant pollutant source if the soils are disturbed. It would be best for the project to avoid disturbing these contaminated soils or filtering stormwater runoff through these soils in order to avoid sending any hazardous materials into the Canal. Honolulu Harbor, at the mouth of the Canal, also represents a likely source of pollutants, including from ship berths. The Sand Island Treatment Plant is also located within the harbor; however, the treated effluent outfall is located miles offshore and unlikely to have any impact on the Canal.

Partner agencies and critical stakeholders for this design component include: City DPP HoLIS and City DDC and DFM.

Collected materials and data of significance to this design component include: information from the University of Hawai'i Sea Grant.

3.5 Canal Management and Maintenance

It is important for the project team to understand the current management and maintenance activities within the Canal, as well as gather input from those currently involved in these activities to better understand what has worked well and what has not worked well in the history of the Canal. These activities include dredging of the Canal, alternative forms of sediment removal, plant maintenance, removal of discarded plant matter, and trash removal. Currently, the grass is cut monthly, and debris and mangroves are removed with a crane as needed, which does not trigger USACE permitting requirements. USACE also dredges the harbor, but not the Canal. It is

unknown the last time the Canal was dredged, and it appears that there is no dredging plan in place for the Canal. Determining USACE's jurisdiction within the Canal will be critical during the design process, as certain proposals may require approval from USACE.

The Canal improvements are an opportunity to focus on best management practices and refine the current maintenance program. It is likely that permits will be required for major maintenance activities within the Canal, and it is important that the design take into account the long-term maintenance requirements and efforts that will be needed for particular design features. Additionally, the design of certain Canal features will affect the existing maintenance activities and schedule, and the design team should be aware of these effects, as well as understand what types of maintenance are feasible within the Canal area and which types will be allowed.

Erosion control is another potential issue within the Canal, and the Canal improvements are an opportunity to mitigate identified areas of concern. Bank stabilization efforts should be concentrated in these areas of concern, and such design features will need to take into account additional bank stabilization efforts that might be required.

Partner agencies and critical stakeholders for this design component include: City DFM, City DDC, and USACE.

Additional data requested or to be gathered from stakeholders include: dredging history and studies.

3.6 Tides

High- and low-tide water levels within the Canal affect the water level available and indicate the measure of diurnal variability. Water and salinity levels vary throughout the Canal, and this varability can affect the types of existing and introduced flora that might survive, as well as the scour and erosion patterns within the channel.
For example, the area around the King Street Bridge appears to be the transition point between the tidal salt water and the fresh water flows.

The first area downstream of low tide, from Nimitz Highway to Dillingham Boulevard, will always have flowing or standing water that is predominately salt water. The second area between the low- and high-tide marks, from Dillingham Boulevard to North King Street and extending to the H-1 Freeway, will have fluctuating water levels with a mix of salt and fresh water. Lastly, the area above high tide, mauka of the H-1 Freeway, will often have minimal flowing water, which is primarily fresh water and stormwater during storm events.

Partner agencies and critical stakeholders for this design component include: National Oceanic and Atmospheric Administration (NOAA).

3.7 Sea Level Rise and Climate Change

While sea-level rise and other climate change effects may primarily be a future issue, their potential effects are known and should be taken into account in the Canal design and improvements. Sea-level rise will alter the existing tidal zones in the Canal and will shift the boundary between salt and fresh water further upstream.

Additionally, climate change will affect the severity and frequency of storm events and likely increase the stormwater runoff entering the Canal. Any flood modeling work for the Canal should account for these changes so as to ensure a no-worsening condition given potential future changes. The types of flora and fauna that will thrive in and along the Canal could change as well. This may have a future effect on the aesthetics of the Canal, but is unlikely to alter the design significantly.

Partner agencies and critical stakeholders for this design component include: Hawai'i Sea Grant and NOAA.

Collected materials and data of significance to this design component include: UH School of Ocean and Earth Science and Technology (SOEST) files related to the Honolulu Rail Transit Project.

3.8 Bathymetric and Topographic Surveys

Bathymetric and topographic surveys of the Canal area will be critical data for evaluating the bathymetry and topography of the Canal and for developing the details of the design. The surveys should include information on the existing bridges and their critical dimensions and the location and size of the stormwater outfalls. Both of these items, although not in the scope of the Catalytic Project, would be needed to create a complete hydraulic model of the Canal.

Partner agencies and critical stakeholders for this design component include: City DDC and NOAA.

Collected materials and data of significance to this design component include: topographic maps.

Additional data requested or to be gathered from stakeholders include: Canal Field Surveys to be conducted by the project team.

3.9 Design Standards

The design standards applicable for the Canal, including those from the USACE and the prescribed design storm, will factor directly into the design of the Canal improvements. Accounting for these standards early in the design process will help the final project concepts meet all applicable standards and requirements, and help decrease design revisions during the agency review phase.

Partner agencies and critical stakeholders for this design component include: USACE, City DPP, City DDC, and State HDOT.

Collected materials and data of significance to this design component include: relevant City design standards.

3.10 Ecology and Marine Resources

Understanding the ecology of the Canal is vital to the design as any protected ecosystems or endangered plants or animal species will need to be identified prior to their disturbance or removal. The design will need to adapt for any protected or endangered species, if identified, including any potential construction related impacts. Additionally, by identifying any invasive or problematic plant and animal species or species of concern (e.g., algae), features can be designed to help discourage their formation or propagation. Also, the planting plan for the Canal should respect native species in the area, and selected plants should live in harmony and thrive with the existing ecology.

Shower trees are standard street trees thriving along the Canal. Additionally, the mangroves in the makai portions of the Canal are likely holding sediment from flowing out into the harbor and decreasing the current / open channel flow. Mangroves are not identified as a protected species, so removing them would be acceptable.

Partner agencies and critical stakeholders for this design component include: UH Marine Center.

Additional data requested or to be gathered from stakeholders include: Aquatic Resources and Water Quality Report to be written by the project team and Terrestrial and Aquatic Biological Survey to be conducted by the project team.

4 Related Planning Studies

The City has developed several plans that provide guidelines and concepts for the planning of Kapālama Canal which include the Honolulu Primary Urban Center Development Plan for 2025 (2004), the Kalihi-Pālama Action Plan (2004), the Kalihi Neighborhood Transit-Oriented Development Plan (2014), and the Kapālama Canal: A Conceptual Plan Study for Flood Control, Landscaping, and Beautification (1980). The City is also currently developing a number of other studies, including but not limited to: the Iwilei Multi-modal Study, the Iwilei/Kapālama Infrastructure Master Plan, and the Iwilei Drainage Study. The following pages provide a summary of the four plans in order of geographic magnitude:

4.1 Primary Urban Center Development Plan (PUCDP)

Adopted in 2004, the PUCDP is a policy guide for sustainable development and growth in Honolulu with guidelines that:

- Protect and enhance natural, cultural, and scenic resources
- Cultivate liveable neighborhoods
- Create and maintain in-town housing choices
- Develop Honolulu as the Pacific's leading city
- Develop a balanced transportation system

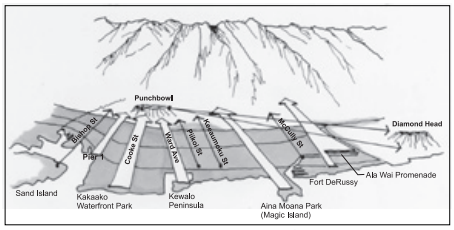


Fig. 4-1 PUCDP View Corridors

Guidelines applicable to Kapālama Canal include developing stream greenbelts, creating parks that draw people and activity, providing active recreation areas, making streets pedestrian-friendly, providing connections to Honolulu Harbor, and creating continuous paths along the Canal.[7]

Strategies to implement the policies and guidelines of the PUCDP include:

- *Retaining and restoring natural vegetation along stream channels where possible*
- *Using riprap armoring and vegetation on the upper banks of stream channels where modification is necesary*
- *Extending and improving the greenbelts to make them more useful components of the open space network for recreational use*
- *Planting trees to provide shade and buffer pedestrians from vehicular traffic*

Fig. 4-2 PUCDP Planning Area

4.2 Kalihi-Pālama Action Plan

Conceived in 2004, the Kalihi-Pālama Action Plan is a vision for the future of 8,500 acres in the neighborhoods of the Kalihi-Pālama area. The plan proposes a series of actions that would improve the quality of life for residents, businesses, and visitors and provides guidelines for:

- Open space and recreation
- Community revitalization
- Beautification
- Activity centers
- Environmental restoration

Fig. 4-3 Vision for King Street

Alongside guidelines, the plan presents opportunities to activate the Canal by creating physical and programmatic connections to adjacent commercial, residential, and mixed-use developments, parks such as Lo'i Kalo Park, and proposed projects including the King Street Multi-Heritage Corridor, Honolulu Community College Town, and a multi-cultural marketplace. The plan also addresses the deficiency of parks in the Kalihi-Pālama area based on City standards and seeks to improve existing parks or develop new parks by combining recreation with other functions. The plan also makes specific recommendations for the beautification of Kapālama Canal (see sidebar).[8]

Specific Recommendations for Kapālama Canal:

- *Establish a one-way traffic pattern system on Kohou and Kōkea Streets*
- *Construct curbs and gutters with on-street parallel parking*
- *Construct walkways between the curb and edge of the Canal*
- *Provide landscaping along the Canal*
- *Provide park furniture*
- *Construct a retaining wall along the stream banks to prevent erosion*
- *Tier the stream edge to allow access to water for fishing, crabbing, walking, biking, and viewing*
- *Dredge the Canal*
- *Construct a pedestrian bridge over the Canal near HCC*

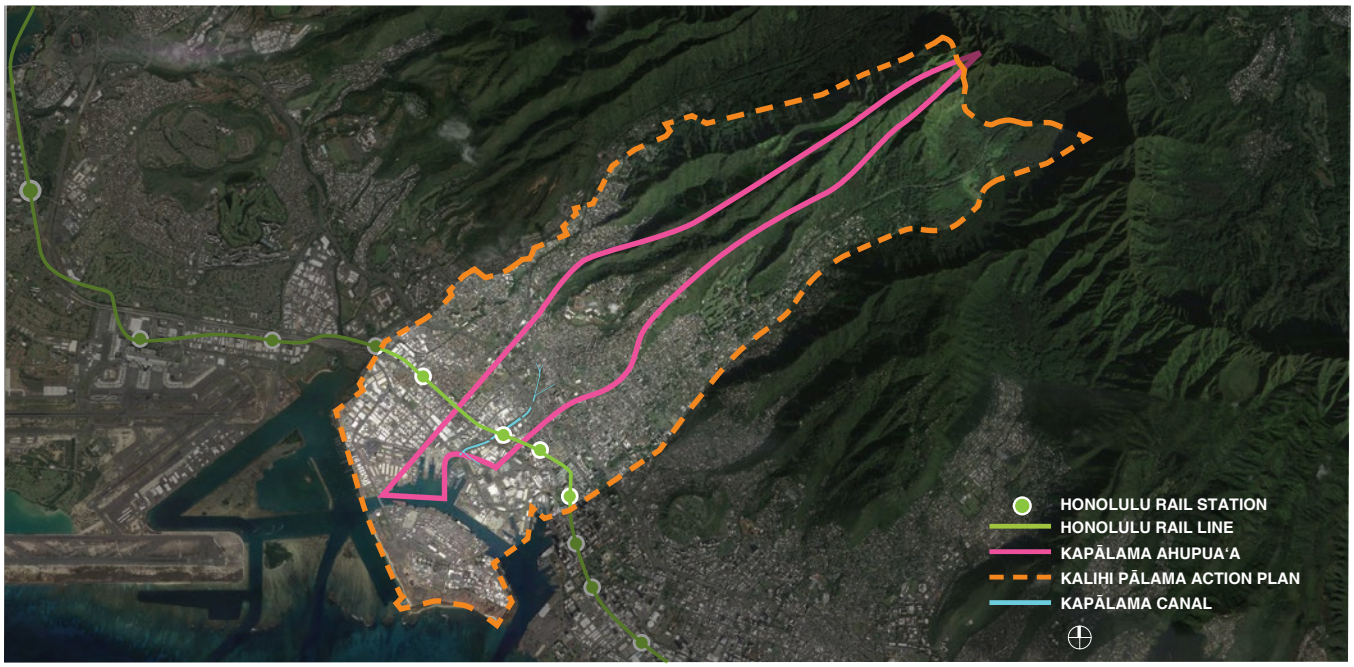


Fig. 4-4 Kalihi-Pālama Action Plan

Community Revitalization Guidelines:

- *Maintain sufficient on-street parking*
- *Acquire vacant properties for off-street parking*
- *Improve bus stops with shelters, benches, and safe setback from streets*
- *Provide sufficient lighting along streets*
- *Consider an efficient one-way circulation pattern, where appropriate, to allow for safe vehicular movement and pedestrian walkways*
- *Acquire setbacks along roadways where appropriate to provide for necessary improvements*
- *Improve or construct sidewalks for pedestrian traffic*
- *Upgrade undersized sewer lines*
- *Replace old water lines*
- *Improve drainage facilities*
- *Install underground electric, telephone, and cable television lines*
- *Recognize the importance of highly traveled streets and consider the following improvements for a visually pleasing driving and walking experience:*
  - » *Provide ADA sidewalks*
  - » *Provide bike lanes*
  - » *Consider character-style lighting, where appropriate*
  - » *Plant street trees*

Beautification Guidelines:

- *Plant street trees along roadways*
- *Plant landscaping along fences or hard surfaces to soften the appearance*
- *Use drought tolerant/ low water use plants and xeriscaping principles. Incorporate efficient irrigation systems*
- *Renovate or reconstruct buildings that characterize the history of the area*
- *Install character-style lighting along major roadways*
- *Create parks and open space to provide visual relief from the built environment*
- *Install underground electric, telephone, and cable television lines*
- *Enforce the use of non-potable water for the irrigation of large landscaped areas if a suitable supply is available.*
- *Organize community clean-up events to remove debris or cover graffiti*
- *Construct entry features to neighborhoods*
- *Install character-style signage within neighborhoods for specific features within the community (community centers, parks, historic sites or buildings, and activity centers)*
- *Consider installing art work in parks*

Environmental Restoration Guidelines:

- *Develop community-based stewardship programs to manage legal access to the conservation district*
- *Control feral pigs and other animals that feed on or destroy vegetation to minimize erosion and increase percolation into the groundwater*
- *Plant native trees and vegetation in the watershed*
- *Control or eradicate invasive, non-native plant species*
- *Respect the community policy to cease the dumping of displaced contamination in the Kalihi-Pālama area from neighboring vicinities*
- *Remove debris from streams*
- *Develop an "Adopt A Stream" program*
- *Preserve the stream corridor through the establishment of stream setback restrictions*
- *Establish bioremediation and "clean" plants at Kupehau Park and Kapālama Canal*
- *Remove vegetation, such as mangrove, near the mouth of streams to increase stream flow to prevent flooding*
- *Stabilize stream banks to minimize erosion*
- *Establish a public awareness program on the resulting negative consequences of stream contamination from debris, pesticides, herbicides, and hazardous wastes*

4.3 Kalihi Neighborhood Transit-Oriented Development (TOD) Plan

Developed in 2014, the Kalihi Neighborhood TOD Plan integrates rail planning with neighborhood planning in a set of guiding principles for the sustainable growth and enhancement of the Kalihi community around the neighborhood's three future transit stations - Middle Street Station, Kalihi Station, and Kapālama Station. The plan provides guidelines that help achieve the following goals:[9]

- Revitalize Kalihi into a more liveable community
  Promote redevelopment/re-use depending on the unique conditions around each station. Invest in the community by enhancing existing facilities and encouraging new development that supports the community vision and capitalizes on transit access.
- Maintain and enhance diversity
  Enhance the unique character of Kalihi, including its multiple ethnicities, multi-generational households, small "mom and pop" businesses, mix of uses, and housing affordability. Address concerns about maintaining the affordability of housing, small businesses, and industrial/warehouse uses.
- Improve the quality of public spaces
  Integrate the rail stations into their surroundings; improve overall streetscapes, including sidewalk improvements/provision, trees and landscaping, new streets to provide better walking connections (particularly mauka-makai connections), and undergrounding of utilities; provide safe and accessible parks and open spaces.
- Improve connections to the waterfront
  Improve access to Sand Island Park and Keehi Lagoon Park, and enable safe and comfortable pedestrian crossing of Nimitz Highway. Enable pedestrian and bicycle access to and views of the waterfront, where feasible.
- Create a convenient and accessible transportation network
  Create a convenient transportation system that integrates bus and rail transit, bicycle facilities, pedestrian connections, and adequate off-street parking. Provide a consistent set of amenities in and around each rail station (e.g., adequate lighting, bicycle parking) to ensure safety and meet basic service needs.
- Increase public safety
  Add lighting, find solutions for the homeless population, abate graffiti, encourage new residential and active uses that provide "eyes on the street," and offer programs for youth to ensure that community members feel safe and that streets are clean and attractive.

The plan also sets forth land use policies, urban design goals, and urban design policies with direct and indirect applicability to the Kapālama Canal Catalytic Project. Directly applicable to the project are the following urban design policies:

- *UD-P6: Design sidewalks to include an unobstructed path for travel, separate from street landscaping and street furniture areas. Reserve the area closest to the curb for street trees, landscaping, street lights, bus stops, street signs, trash/recycle bins, bicycle parking, street furniture, and newspaper boxes.*
- *UD-P7: Create walkable blocks of approximately 350 feet in length around the Kapālama station. Provide mid-block pedestrian connections on longer blocks that maintain sight lines from one end to another; install clear signage that acknowledges that the space is for public use.*
- *UD-P8: Scale development along pedestrian-oriented retail streets and pedestrian connections with fine-grained, highly articulated facades, changes in materials, ample fenestration, and visible entryways. Equip pedestrian paths with shade trees, seating, kiosks, lighting and other amenities.*
- *UD-P9: Retain historic curb stones wherever they currently exist, and restore them in areas where they were used historically.*

- *UD-P10: Implement low-impact design and stormwater management best practices and maximize porous surfaces in the design of development sites, streets, and streetscapes, especially around the Middle Street station where flood risk is highest.*
- *UD-P11: Maintain pedestrian safety and the health of trees by planting street trees with non-agressive root systems and allowing adequate tree planting area to avoid uplift of pavement*
- *UD-P28: Develop at least one large park (of at least five acres) within a ½-mile of Kapālama/ Iwilei stations. A large park should provide recreational facilities such as community centers, basketball courts, ball fields, children's play areas, picnic areas, and restrooms.*
- *UD-P29: In the Kapālama station area, where space may be limited, provide open space in the form of plazas and accessible rooftop gardens. Provide active uses along or within these spaces, as well as amenities such as seating, shade, and landscaping. Clearly indicate access to rooftop gardens through signage that is visible from the public street.*
- *UD-P30: Require a minimum dimension of eight feet for all open spaces (publicly accessible as well as private).*
- *UD-P31: Provide a diverse range of amenities in park spaces, including benches, trees, lighting, drinking fountains, and trash receptacles. Provide a mix of landscaped and hardscape areas that provide opportunities for resting and shade, outdoor eating, and other activities.*
- *UD-P32: Design promenades to create a sense of continuity and cohesiveness, with opportunities for walking and biking along the waterfront, lingering at overlook points, and visiting multiple destinations:*
- *The promenades should display a unified urban design scheme, with amenities such as benches, art, landscaping, lighting, banners, textured paving, and spaces for vendors and public functions.*
- *Kapālama Canal: Provide continuous pedestrian walkways on both sides of the Canal. Design Kohou Street as a slow vehicle street, with design elements such as special pavers, pedestrian areas defined by bollards, and a clearly marked parking aisle. Locate any open spaces and plazas adjacent to the promenade, and design them to provide a transition between private and public space.*
- *UD-P33: Emphasize visibility and access to open spaces abutting streets or promenades by providing seating and shade along open space edges.*
- *UD-P34: Where possible, orient private open spaces, such as courtyards, balconies, and building entrances toward open spaces to provide a transition between private and public activities and to increase safety.*
- *UD-P35: Maximize the efficiency of open spaces through joint usage and alternating time of-day uses. Joint (co-located) uses may include schools and rooftop gardens; parks and child care facilities; and subterranean or tuck-under parking below new parks and plazas.*

Fig. 4-5 TOD Plan Vision for Kapālama Canal

As shown in Figures 4-6 and Fig, 4-7, the rail line crosses the Canal along Dillingham Boulevard. The guideway columns will run along the Dillingham Bridge and HART is currently proposing to widen the bridge 20' in the makai direction. The future rail stations is currently planned to be located on both sides of Dillingham Boulevard at Kōkea Street.

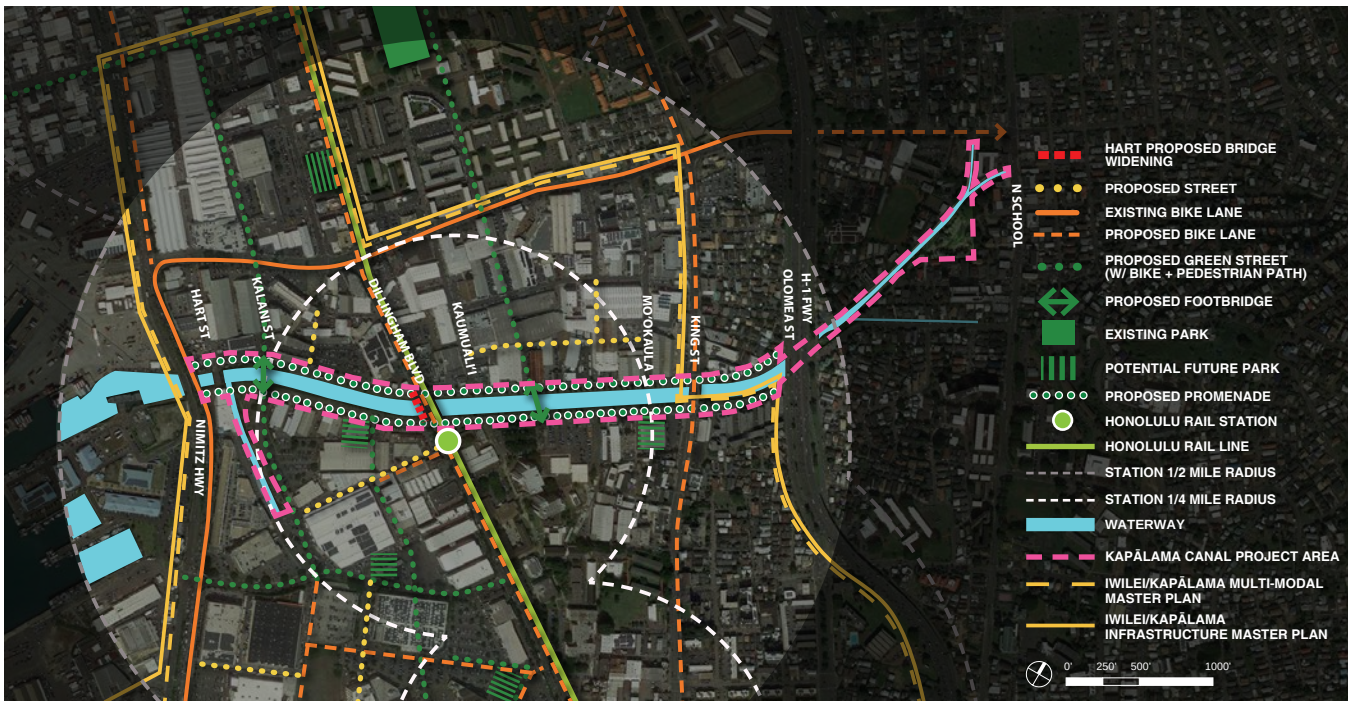


Fig. 4-6 TOD open space and circulation overlay

Fig. 4-7 TOD land use overlay

4.4 Kapālama Canal: A Conceptual Plan Study for Flood Control, Landscaping, and Beautification

Conceived in 1980 by the Department of Public Works in response to community interest in improving Kapālama Canal to enhance community use, the Conceptual Plan Study proposes improvements of the area in and around the Canal from the old Oʻahu Rail and Land Company Bridge near Nimitz Highway to Houghtailing Street that:[1]

- Preserves much needed open space
- Upgrades substandard neighborhood conditions
- Exploits recreation opportunities

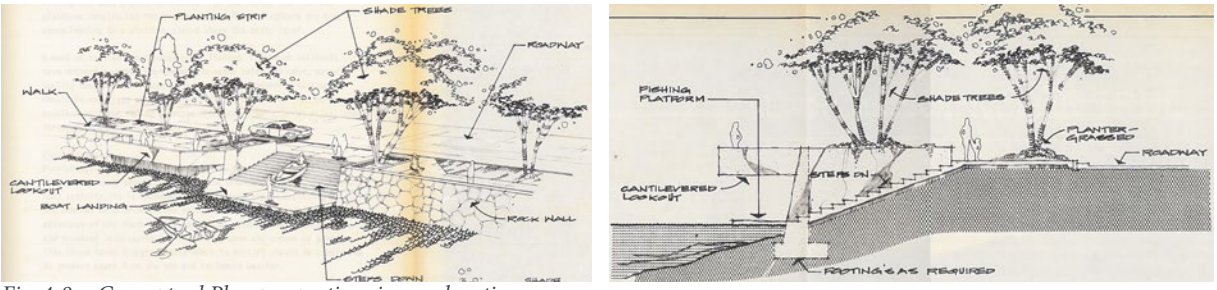


Fig. 4-8 Conceptual Plan perspective view and section

Specific recommendations include:

- Canal improvements, including retaining walls along the Canal to maximize the width of the banks for planting and landscaping, and platforms for fishing and boating
- A mini-park off Kōkea Street on the former site of the City Incinerator with landscaping, picnic areas, and a comfort station
- A pedestrian overpass over the H-1 Freeway along Kohou Street to continue the promenade to Houghtailing Street
- Street improvements and beautification along Kōkea Street, such as landscaping and addressing safety

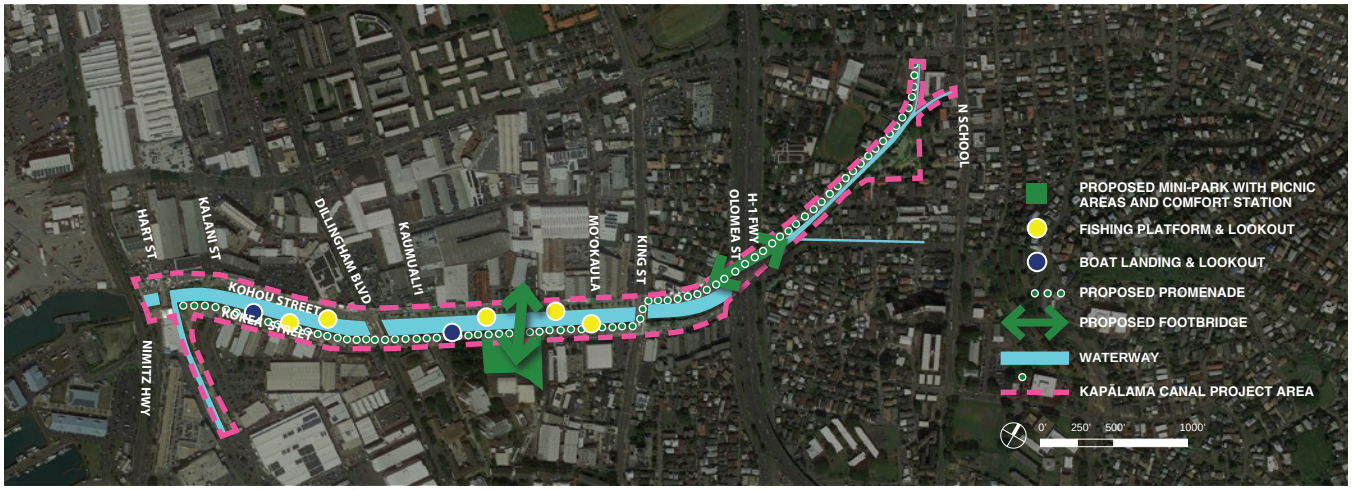


Fig. 4-9 Primary design elements of Conceptual Plan Study

5 Jurisdiction, Landownership, and Regulations

5.1 Jurisdiction

The State of Hawai'i and City share jurisdiction over Kapālama Canal - HDOT Harbors Division presides over the portion of the Canal between Nimitz Highway and the old O'ahu Rail and Land Company bridge, the State of Hawai'i Department of Land and Natural Resources (DLNR) over the portion between Kalani Street and Nimitz Highway, and the City governs the Canal from Kalani Street to Houghtailing Street, with exceptions along bridges noted below.[10] The portion of the Canal below the H-1 Freeway is tidal and considered waters of the United States, thus regulated by USACE. Jurisdictional complexities not only exist in the waterway, they also exist within rights of way, bridges over the Canal, and ownership and maintenance of public lands. For example, the old O'ahu Rail and Land bridge that spans over the Canal is privately owned; Dillingham Bridge and King Street Bridge are owned by the City, while Nimitz Highway, the H-1 Freeway, Halona Street, and Olomea Streets are owned by the State HDOT Harbors Division. Questions of ownership and maintenance may arise with modifications to Canal banks, addition of parks/open space, and designing for Complete Streets and bicycle/pedestrian paths.

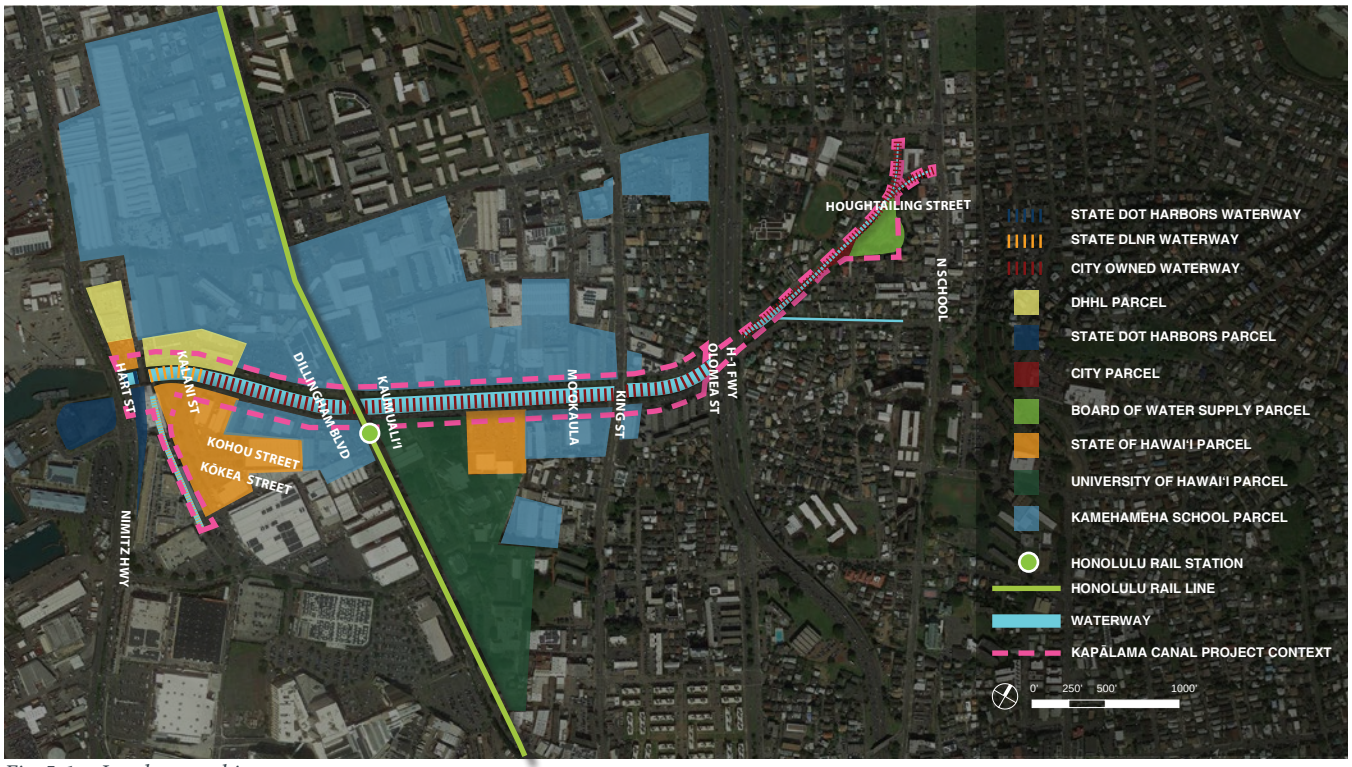


Fig. 5-1 Land ownership map

5.2 Landowners

The planning and design of the Kapālama Canal Catalytic Project in coordination with adjacent land development will be critical to creating a vibrant neighborhood. Adjacent lands are owned by a number of public, private, and institutional entities (see Fig. 5-1), with large parcels owned by a few key landowners. Kamehameha Schools (KS) owns 105 acres in the Kapālama area, and about half of the land immediately adjacent to Kapālama Canal. The

Department of Hawaiian Home Lands (DHHL), HCC, and the State of Hawaiʻi are also significant landowners with property immediately adjacent to the Canal. KS, DHHL, and HCC currently have evolving development plans for their parcels, and an implementation strategy that integrates the land use, timeframe, and programming of these plans with those of the Kapālama Canal will be critical to the success of the Catalytic Project for a number of reasons, including but not limited to funding, public/private partnerships, activating public and private spaces, and shared maintenance.

5.3 Landowner Development Plans

As noted in the TOD Plan land use overlay (Fig. 4-7), the majority of KS land in the area is currently zoned for industrial and commercial uses, and will be re-zoned for medium to high density residential and mixed use. Currently, several shopping destinations exist on KS Kapālama lands, including a portion of the City Square Shopping Center, Chinatown Marketplace, Kōkea Center, and Kapālama Shopping Center. In 2000, KS developed a Kapālama Strategic Implementation Plan that identifies principles to guide the character, connectivity, and community life of the district. The plan includes options for a linear park along Kohou Street, as well as development plans for particular parcels along the Canal with lease expirations ranging from 2017 to 2038.[11]

In 2011, HCC prepared a Long Range Development Plan for their 25.9-acre main campus on Dillingham Boulevard, which includes a new Advanced Technology and Training Center, a parking garage (with potential housing above) on the old Incinerator site, and campus re-organization that integrates the future Kapālama transit station at the corner of Kōkea Street and Dillingham Boulevard into a gateway for the campus. The plan identifies goals and implementation strategies for achieving these goals (see sidebar). Preliminary plans (see Fig. 5-2) show a landscaped median planted with loulu palms separating the vehicle turn-out from Kōkea Street, marking the main pedestrian entry into the campus, and drawing pedestrians into a double row of loulu palms that creates a promenade into the campus. Further mauka, a park-like edge will be created to encourage more vibrant pedestrian usage. A 50-foot setback between the planned Kōkea Street parking garage and the street will feature lush plantings. Relocated mahogany trees will extend along the Kōkea Street edge to continue the row of existing street trees. HCC also owns a 6.5-acre parcel on the Kōkea Street campus a few blocks makai of the main campus, which consists of surface parking with medians planted with a variety of medium-canopy shade trees that include shower, kou, and monkeypod trees.[12]

Guiding principles of KS's Kapālama Strategic Implementation Plan:

- *Establish a Pikoʻekolu Structure and Gathering Places*
- *Establish Innovation and Incubator Corridors*
- *Create Gateways into the District*
- *Maintain Historic Relationships to Ahupuaʻa - Mauka/ Makai Connectivity*
- *Establish/Clarify District Identity*
- *Build on Transit-Oriented Development Opportunities*
- *Infuse a Hawaiian Orientation*

Goals of HCC's Long Range Development Plan:

- *Sense of Place*
- *Campus Organization*
- *Sustainability*
- *Circulation*
- *Student Engagement*

DHHL owns roughly 5 acres of IMX-1 (Industrial Mixed Use) zoned land in the Kapālama area close to Nimitz Highway that currently houses an office building, a portion of a shopping center, a radio station antenna tower, and an industrial fresh produce facility. The office building and shopping center are under a long-term general lease scheduled to expire in 2045. The fresh produce facility is also under a general lease scheduled to expire in 2070, while the radio station's license is scheduled to expire in 2029.[13]

Fig. 5-2 HCC Proposed Campus Plan

5.4 Revised Ordinances of Honolulu

The following City ordinances are relevant to the Canal Project:

5.4.1 Chapter 14, Article 11: Use of Indigenous and Polynesian Introduced Plants in Public Landscaping

Chapter 14, Article 11, Sec. 14-11.2 Implementation:[14] Use of Indigenous and Polynesian Introduced Plants in Public Landscaping states, "Wherever and whenever feasible, all plans, designs, and specifications for new or renovated landscaping of any building, complex of buildings, facility, complex of facilities, park, or housing developed by the City with public moneys shall incorporate indigenous and Polynesian introduced plant species, provided that:

- Suitable cultivated plants can be made available for this purpose without jeopardizing wild plants in their natural habitat; and
- Wherever and whenever possible, plants indigenous to O'ahu shall be used."

Per Sec 14-11.1 Definitions:
"Indigenous" means any land plant species growing or living naturally in Hawai'i without having been brought to Hawai'i by humans.

"Polynesian Introduced" means any plant species brought to Hawai'i by Polynesians before European contact, such as kukui, noni and coconut.

5.4.2 Chapter 21: Land Use Ordinance

The Land Use Ordinance outlines zoning regulations and provides general standards for development in Honolulu including but not limited to land use, lot size, building heights, setbacks, building areas, parking requirements, open space requirements, sign regulations, landscaping, and special districts.[15]

Under the Land Use Ordinance, a TOD zoning plan will be drafted but recognizing that developers may be ready to start planning and investing in TOD, a permitting process known as the Interim Planned Development-Transit (IPD-T) is available now for adjacent development.

5.4.3 Chapter 41, Article 13: Protective Regulations for Exceptional Trees

"Exceptional trees" are by definition "…a tree or grove of trees with historic or cultural value, or which by reason of its age, rarity, location, size, aesthetic value or endemic status has been designated by the city council as worth of preservation."[16]

No exceptional trees are located within the project scope.

5.5 Chapter 343 Hawai'i Revised Statutes

Based on a cursory review of the Kapālama Canal Improvements Regulatory Assessment,[17] it is understood that the Kapālama Canal Catalytic Project will "trigger" the need for compliance with Chapter 343, Hawai'i Revised Statutes (HRS), also referred to as the Hawai'i EIS Law, as project activities will utilize City lands and funds. The EIS will be processed as an "agency action" by the DPP.

5.5.1 EIS Process

At each step in the process, EIS documents (EIS Preparation Notice [EISPN], Draft EIS [DEIS], and Final EIS [FEIS]) must be submitted to the Office of Environmental Quality Control (OEQC) for publication in The Environmental Notice.[18]

- An EIS may begin with an FEA or bypass the preparation of an EA process completely and proceed to the EIS Preparation Notice (EISPN) that undergoes a 30-day comment period. The consultation process of the EISPN affords agencies, organizations and individuals an opportunity to request to become a consulted party in the preparation of the EIS.
- Next, the study is compiled and printed as a Draft Environmental Impact Statement (DEIS). The DEIS must include copies of comments received and responses sent for the FEA/EISPN or the Act 172-2012 EISPN during the 30-day comment period. The EIS content requirements are provided in Part 6.2 of OEQC's HEPA Citizen's Guide.
- The DEIS is circulated to consulted parties with a 45-day public comment period. The applicant or approving agency must respond to the comments received during the DEIS public review period in a point-by-point manner. After comments have been received and responded to, the DEIS is finalized with updated information and copies of comments received and responses.
- The final document (FEIS) must be accepted by the accepting authority as complete and technically adequate

before the proposed project can be implemented. The acceptance of an FEIS may be challenged.

- Aggrieved parties have 60 days from notification of acceptance/ non acceptance determination in The Environmental Notice to challenge the acceptability of the final document in court.
- For agency actions, the accepting authority for an EIS on proposed state actions is the governor, and for county actions, the mayor.

5.5.2 Chapter 6E, HRS Compliance

The EIS process will require that the project comply with the State's Historic Preservation Requirements (HRS, Chapter 6E). Project compliance with Chapter 6E, HRS will be coordinated through the preparation of an Archaeological Inventory Survey Plan.

5.6 Land Use Considerations

5.6.1 State Land Use Districts

The Kapālama area, including the Kapālama Canal, is within the State urban district. "Urban districts shall include activities or uses as provided by ordinances or regulations of the county within which the urban district is situated." The proposed action conforms to the State's vision for the "urban district". A further discussion of the project's compliance with State Land Use laws will be included in the forthcoming EIS.

5.6.2 County Zoning

Generally speaking, the majority of the project site / alignment of the Kapālama Canal falls within the IMX-1, BMX-3, and R-5 zoning. A further discussion of the project's compliance with county zoning will be included in the forthcoming EIS.

5.6.3 Special Management Area

The Special Management Area (SMA) was created to manage coastal development. The project does not lie within the SMA.

5.6.4 Waters of the United States

Construction activities associated with the proposed action are anticipated to encompass work within "waters of the United States" regulated by the USACE. These activities will require the approval of a Clean Water Act (CWA) Section 404 permit by the USACE. The CWA Section 404 permit may also trigger a DOH 401 Water Quality Certification. It is also recognized that any work within the tidal influence may also require a Section 10 permit from the USACE.

It is noted that project team is not currently scoped to engage USACE regarding consultation / permitting under the project scope. The full extent of USACE jurisdiction and permitting requirements over the project will be determined once USACE is formally engaged in consultation. It is our understanding that compliance with USACE regulatory requirements for work in waters of the USA will be met by the City following the completion

of the project's presently agreed upon scope. It should be noted that while project compliance with Chapter 6E of the Hawai'i Revised Statutes (HRS) is not equivalent or interchangeable with Section 106 of the National Historic Preservation Act (NHPA) compliance, a State Historic Preservation Division (SHPD) "no effect" finding/determination pursuant to Chapter 6E will be of significant supplementary value to the county in meeting Federal Section 106 requirements. Generally speaking, the processing of the USACE permits for the proposed action will take approximately one-and-a-half to two years.

5.7 Other Required Permits / Regulatory Approvals

5.7.1 Federal Cross-Cutter Compliance

It is assumed that federal Cross-Cutter permitting requirements would be triggered by the application for USACE permits by the City. As the application for those permits will come after the subject project's present scope of work is completed, consultation pursuant to those requirements (for example, Section 7 of the Endangered Species Act and Section 106 of the NHPA) are not included as part of the EIS process. The need for future compliance with applicable federal requirements will, however, be recognized and disclosed in forthcoming EIS documentation.

5.7.2 Stream Channel Application Permit

The proposed action will likely require the approval of a Stream Channel Application Permit (SCAP) issued by the State Commission Water Resource Management (CWRM) triggered by alterations to the Canal channel. Chapter 343, HRS as well as USACE permitting compliance will be required prior to the submittal of a SCAP permit application to CWRM. Generally speaking, the processing of a SCAP permit will take approximately one year. Forthcoming EIS documentation will discuss and assess the remaining balance of environmental and land use permits as they pertain to the proposed action. A list of agencies to be consulted as part of the EIS process is included in Appendix A.

6 Community Design

The community surrounding Kapālama Canal consists of a diverse, multi-ethnic, and multi-generational population. The neighborhood is seen as convenient and relatively inexpensive for new immigrants and long term residents, while also being perceived as busy and safe during the day but unsafe at night due to crimes related to drugs and prostitution. The neighborhood does not project a cohesive identity, but it does have a range of unique uses and architectural styles, small businesses, "mom and pop" shops, and housing types.[22] The Kapālama Canal Catalytic Project should leverage existing community resources and elevate the unique multi-ethnic identity that already exists within the community. Below are a list and map of some community events that take place annually in the neighborhood that could present potential synergies for Canal activation. The events are mapped alongside area business and institutions, and a more comprehensive list of community stakeholders to be consulted during the design process can be found in Appendix B.

Fig. 6-1 Community Events Calendar

Date	Organization	Event
January	Filipino Chamber of Commerce	Taste of Kalihi
February	Kamehameha Schools	Hoʻolauleʻa
April	Kokua Kalihi Valley	Kokua Community Farm Day
April	YMCA/Kalihi Pālama Health Center	Healthy Kids Day
May	Kalihi Pālama Culture & Arts	Malia Craver Hula Kahiko Competition
June	Jikoen Hongwanji Buddhist Temple	Bon Dance
June	Kalihi Pālama Culture & Arts	Queen Liliʻuokalani Keiki Hula Competition
August	Bishop Museum	BPB Museum Dinner
October	Pālama Settlement	Malama Pālama Gala
October	Puerto Rican Heritage Society	"Festa" at the Plantation Hispanic Heritage Day
Various	Kalihi Business Association	Kalihi Christmas Parade Tailgate Event Wine Tasting & Automobiles
Various	Keiki O Ka Aina Family Learning Center	Lei Making Lomilomi Hula
Various	Hoʻoulu ʻĀina	Community Workdays
Various	Kalihi Ahupuaʻa Ulu Pono Ahahui	Workdays
Various	Paʻi Foundation	Helumoa – Hapa Haole Hula Competition Hapa Haole Hula Festival Concert Festival of Pacific Arts & Culture 2020
Saturdays	Department of Parks & Recreation	People's Open Market

Fig. 6-2 Community Stakeholder Map

Community Stakeholders

1. Bishop Museum
2. Damien Memorial High School
3. D'Otani Produce
4. Farrington High School
5. Ferguson
6. Foodland
7. Hawaii News Now
8. Helena's Hawaiian Food
9. Honolulu Community College
10. Honolulu Ford
11. Kalihi Palama Health Center
12. Kalihi YMCA
13. Kamehameha Bakery
14. Menehune Mac Candies
15. Loʻi Kalo Park
16. Paʻi Foundation
17. Palama Settlement
18. Palama Supermarket
19. Queen Liliuʻokalani Children's Health Center
20. Tamashiro Market
21. Young's Fish Market
22. Zippy's

Community Events

1. Healthy Kids Day - YMCA
2. Hoʻolaulea - KS Kapālama (off map)
3. People's Open Market
4. Taste of Kalihi - Filipino Chamber of Commerce

7 References

1. RM Towill. 1980. Kapālama Canal: A Conceptual Plan Study for Flood Control, Landscaping, and Beautification. City & County of Honolulu Department of Public Works: Honolulu, Hawaiʻi.
2. Juvik, Sonia and James. 1998. Atlas of Hawaiʻi, Third Edition. University of Hawaiʻi Press: Hilo, Hawaiʻi.
3. U.S. Department of Transportation Federal Transit Administration and City and County of Honolulu Department of Transportation Services. June 2010. Honolulu High-Capacity Transit Corridor Project: Final Environmental Impact Statement/Section 4 (f) Evaluation.
4. Mason Architects. July 2008. Honolulu High Capacity Transit Corridor Project : Surveyed Property considered eligible for National Register: Dillingham Bridge.
5. State of Hawaiʻi Department of Transportation. February 2016. Draft Environmental Statement: Halona Street Bridge Replacement Project Interstate Route H-1.
6. Mason Architects. July 2008. Honolulu High Capacity Transit Corridor Project : Surveyed Property considered eligible for National Register: Kamani Trees.
7. Department of Planning and Permitting City & County of Honolulu. June 2004. Primary Urban Center Development Plan for 2025.
8. Townscape, Inc. September 2004. Kalihi Pālama Action Plan. Department of Planning and Permitting City & County of Honolulu.
9. Dyett & Bhatia. November 2014. Kalihi Neighborhood Transit Oriented Development Plan. City and County of Honolulu.
10. Honolulu Land Information Systems. "Maps of Oʻahu Parcel & Zoning Information." http://www.honolulugis.org/. (update: 2015; accessed: August 2016).
11. Kamehameha Schools. September 2000. Kapālama Strategic Implementation Plan.
12. Helber Hastert & Fee. March 2011. Honolulu Community College Long Range Development Plan. University of Hawaiʻi Honolulu Community College.
13. Department of Hawaiian Home Lands. January 2016. Request for Proposals for Conceptual Plans for Department of Hawaiian Home Lands on Oʻahu for Potential Transit-Oriented Development.
14. Revised Ordinances of Honolulu, 1990. Ch. 14
15. Revised Ordinances of Honolulu, 1990. Ch. 21
16. Revised Ordinances of Honolulu, 1990. Ch. 41

17. Townscape, Inc. Kapālama Canal Regulatory Assessments. Kamehameha Schools, June 2011.

18. Office of Environmental Quality Control (OEQC), State of Hawaiʻi, 2012. The Environmental Notice, http://oeqc.doh.hawaii.gov/default.aspx

19. Office of Conservation and Coastal Lands, State Department of Land and Natural Resources: http://www.hawaii.gov/dlnr/occl/subzone.php

20. City and County of Honolulu. Amended October 3, 2002. General Plan, Objectives and Policies.

21. City and County of Honolulu, Department of Planning and Permitting. June 2004. Primary Urban Center Development Plan.

22. Dyett & Bhatia. June 2011. Kalihi Neighborhood Transit Oriented Development Plan Existing Conditions Report. City and County of Honolulu.

7.1 Civil Data References

7.1.1 As-Builts and Record Drawings

- From the City & County of Honolulu (CCH) Department of Planning and Permitting (DPP) Archives:
- City Square 1996
- Kapālama Drainage 1937
- Kapālama Improvements 1958
- Kohou St Improvements 1947
- Kohou St Improvements 1973
- Kohou St Relief Drain 1967
- Kohou St Relief Sewer 1978
- Kohou St Sewer Extension 1968
- Kohou St Water Main 1948
- Kōkea Center 1984
- Kōkea St Improvements 1960
- CCH Department of Public Works, Division of Engineering. Kapālama Canal Bank Improvements, Phase 3. 1980.
- CCH Department of Public Works, Division of Engineering. Kapālama Canal Flood Control, Landscaping and Beautification. 1981.
- R. M. Towill. Topographic Survey of Kapālama Channel Bank Improvements, Phase 3. 1993.

7.1.2 Design Standards

- CCH DPP. Storm Water BMP Guide. December 2012.
- CCH DPP. Rules Relating to Storm Drainage Standards. January 2000.

7.1.3 Environmental Assessments, Natural Hazards, and Water Quality

- CCH. Tsunami Evacuation Map. April 2015.
- From the Office of Environmental Quality Control Archives:
- University of Hawaiʻi (UH), Honolulu Community College. Advanced Technology Training Center, Final Environmental Assessment. December 2010.
- State of Hawaiʻi, Department of Transportation, Highways Division. Halona Street Bridge Replacement Project, Interstate Route H-1 (Adjacent), Draft Environmental Assessment. February 2016.
- Matthew Gonser, University of Hawaiʻi Sea Grant College Program (Hawaiʻi Sea Grant). Natural Hazards and Water Quality Information. January 2016.

7.1.4 Geotechnical Data and Hazardous Materials

- R. M. Towill. Kapālama Canal Bank Improvements, Soil Exploration Report. April 1979.

7.1.5 Master Plans and Reports

- CCH Department of Public Works. Master Plan Report for Kapālama Canal Flood Control, Landscaping and Beautification Project. April 1976.
- Honolulu Board of Water Supply (BWS), Department of Land and Natural Resources (DLNR) Engineering Division, and United States Army Corps of Engineers (USACE) Honolulu District. West Honolulu Watershed Study, Final Report. May 2003.

7.1.6 Sea Level Rise and Climate Change

- National Oceanic and Atmospheric Administration (NOAA). Sea Level Rise Maps.
- UH School of Ocean and Earth Science and Technology (SOEST). Sea Level Rise Maps, including base, flood, hurricane, and tsunami conditions. 2014.
- UH SOEST. Sea Level Vulnerability along the Honolulu Rail Transit Project (HART) Rail Line – Map. 2016.
- UH SOEST. Sea Level Vulnerability along the Honolulu Rail Transit Project (HART) Rail Line, 2050 and 2100 Scenarios – Presentation. 2016.

7.1.7 Stormwater Runoff and Drainage

- United States Geological Survey (USGS) StreamStats Website. Drainage Area Data for Plate 6 – Kapālama Canal.

- USGS. Design Curves for Peak Discharge vs. Drainage Area for Plate 6 – Kapālama Canal. February 2003.
- Arthur Y. Akinaka, Ltd. Consulting Engineers. Hydrology and Hydraulic Report on Kapālama Canal. December 1971.

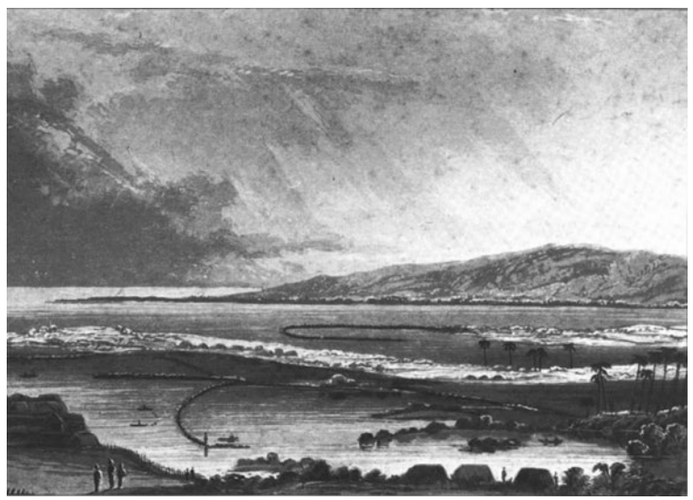
KAPĀLAMA

HISTORICAL & CULTURAL BRIEF

Kapālama Canal is located in the ahupuaʻa of Kapālama. Over the last two centuries, Kapālama has undergone dramatic transformations, from a loʻi-covered floodplain to a working class neighborhood and industrial center. This cultural brief looks at Kapālama's history in two periods, Yesterday (pre-1900) and Today (1900 - present).

Kapālama Yesterday

The ahupuaʻa of Kapālama is sandwiched between Nuʻuanu to the east and Kalihi to the west. It is watered by two streams, Kapālama and Niuhelewai, and consists of nearly forty smaller subdivisions, called ʻili. The mauka area is known today as Kapālama Heights. The makai area is called Kapālama Basin, and it's part of the Honolulu Harbor protected shoreline.



The Kawa and Kūwili fishponds at the border of Kapālama and Honolulu, by Lord Byron, circa 1836.

Historical Names

The name for an area can tell us something about its historical significance, and that is true for Kapālama. The root of *Kapālama* is *pā lama*.

Lama is an endemic tree, a member of the ebony family. Traditionally, it had many ceremonial and fishing-related uses. It was used to construct hinaʻi (fishtraps) and mākāhā, the sluice gates that trapped larger fish in loko iʻa (fishponds). *Lama* is also the word for *torch*, which fishermen used for night-fishing. Lamakū were large, lighted structures that stood along shorelines and helped fishermen find their way back to shore.

A *pā lama* is a fenced enclosure made from the lama sapwood. The pā lama played an important role in the mating rituals of the high chiefs. After a young aliʻi couple married, and prior to consummation, they would be separated and placed under the care of a guardian within a pā lama. Various rituals would be performed to ensure a successful mating. The name Kapālama is a link to this ancient practice. It's here where these important mating rituals once took place.

Where Battles Were Fought

At least two significant battles are said to have occurred in Kapālama. One comes from a mo'olelo that involves a supernatural turf war with the Hawaiian deity Haumea; the other, a punishing massacre at Niuhelewai in the period just before Kamehameha the Great's reign.

The **Legend of Kaulu** tells the story of a young man's journey to rescue his older brother from the mythical hidden island of Kuaihelani. On his return home, Kaulu visits Niuhelewai. He encounters Haumea, who threatens him with death should he proceed any further. Haumea, the great earth goddess of food supply, marriage, and childbirth, had a home at Niuhelewai. She was a resident deity of Kalihi Valley. Kaulu promises to return on the following day, when they will fight.

In the meantime, Kaulu prepares for battle. He secures two magical nets from Makaliʻi, a semi-divine figure usually connected with navigational symbols and legends. He takes these nets, plus four conventional fishing nets, and surrounds Haumea's home while she sleeps.

Once the nets are secured, he wakes her with a chant. Enraged, she tears at the nets. She cuts easily through the four layers of fishing net, but the nets from Makaliʻi prove impenetrable. Try as she might, she's unable to break free. Exhausted, Haumea eventually falls asleep, and while she's asleep, Kaulu sets her home on fire, and she perishes.

Kapālama was also the site of the famous **Niuhelewai Massacre** by Kahekili and his army, shortly after he seized power from the the Oʻahu chief Kahahana in 1783.

Kahahana was the last of Oʻahu's independent kings. The Maui king Kahekili had wanted to rule Oʻahu for some time, and in 1783, he was able to seize power after defeating Kahahana and his forces in lower Nuʻuanu, near Kapena Falls. Kahahana, along with his wife and a friend, fled and lived in the mountains near Wahiawā for two-and-a-half years before being captured and killed.

Shortly after Kahahana's death, the Oʻahu chiefs conspired to murder the Maui chiefs. Somehow, word got out, and all

but one (a chief named Hūʻeu) of the Maui chiefs managed to escape execution.

Kahekili eventually learned that it was the Oʻahu chiefs from the ʻEwa and Kona districts who had conspired against him. The chiefs were killed, and as punishment, Kahekili and his men massacred the residents of their districts. It was said that at Niuhelewai Stream, the water ran red with the blood of Kapālama's men, women, and children

A Flourishing District

Like its surrounding districts, Kapālama was a highly productive ahupuaʻa. Its floodplain, fed by the Kapālama and Niuhelewai streams, supported an extensive loʻi system that once covered the area between Iwilei up to the foothills above School Street. Further up mauka were forested areas where ʻiliahi (Hawaiian sandalwood) grew. The fragrant wood was harvested extensively between 1810 and 1830 and used for trade and export with Asia.

Fishponds comprised the eastern banks of Kapālama's makai region. A pond called Kūwili was located on the eastern edge of Kapālama. Kūwili was a loko puʻuone, a type of fishpond that's closed off from the sea by a bank of sand. A map from 1886 also denotes two neighboring ponds called Loko Kapukui and Loko Kealia. Little else is is known about these sites. Abutting these ponds was Kawa at the edge of Honolulu. It was large loko kuapā, a type of shoreline pond that's encircled by a coral or stone wall.

Shortly after establishing rule over Oʻahu near the end of the 18th century, Kamehameha the Great spearheaded the restoration of the many loʻi that had been damaged or abandoned during the wars. He set aside several large tracts, including areas in Kapālama, to replenish the food supply. "These tasks Kamehameha tended to personally, and he participated in all the projects," remarked the historian John Papa ʻĪʻi, "his farms at Kapālama, Keoneula, and other places became famous."

Māhele

During the Māhele, the ahupuaʻa of Kapālama was awarded to Moses Kekūāiwa, a grandson of Kamehameha I. The land passed through several aliʻi estates before ending up in the estate of Bernice Pauahi Bishop.

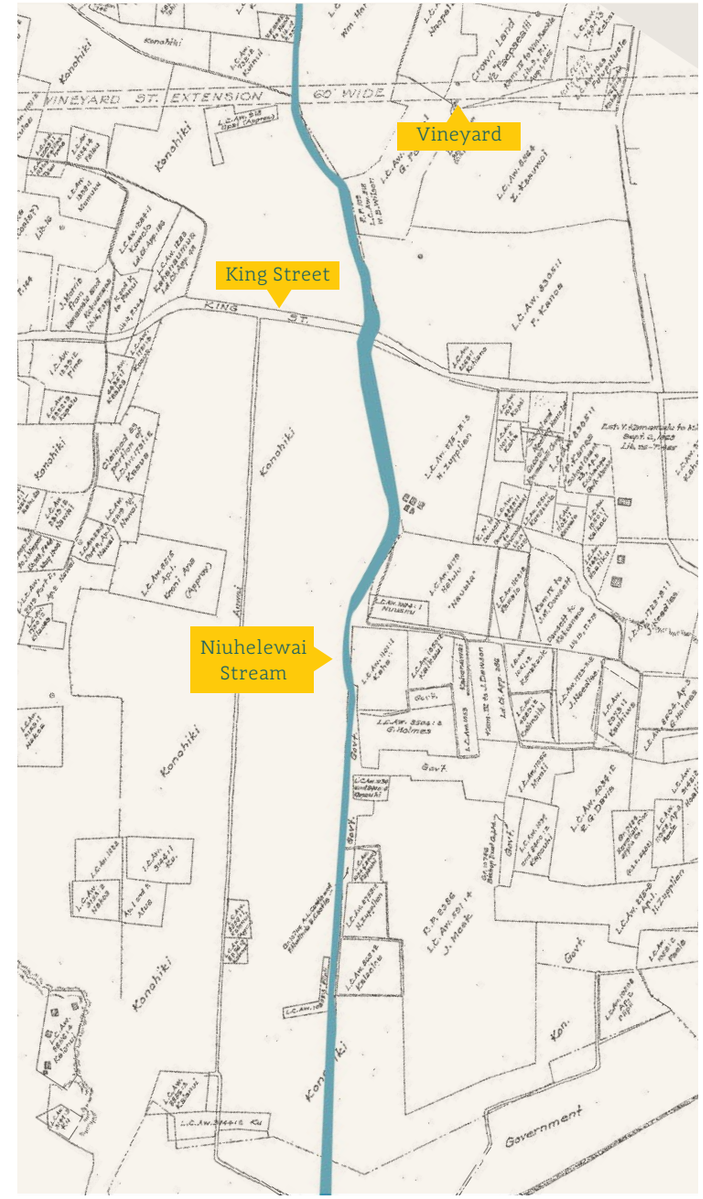
Individual kuleana lots within Kapālama were awarded to the makaʻāinana residents of Kapālama pursuant to the 1850 Kuleana Act. There were roughly 100 kuleana awards in Kapālama. A map from 1885 denotes the various kuleana plots spread across the Kapālama plain. A patchwork of habitation and farming sites is clearly visible.

Kamehameha Schools

For nearly 130 years, Kapālama has been home to Kamehameha Schools and the thousands of Native Hawaiian students who have attended its campuses over the years.

The school's founder is Princess Bernice Pauahi Bishop, the great-granddaughter of Kamehameha I. As the last royal descendant of the Kamehameha line, she inherited the vast landholdings of her royal ancestors, the bulk of which came from her cousin Ruth Keʻēlikolani.

When she died in October of 1884, Pauahi's estate comprised some 375,500 acres. She set these lands aside in trust and dedicated their use to the education of Native Hawaiians.



Kapālama surrounding Niuhelewai Stream, 1885

Spring-fed ponds, homes and the pineapple canneries near present-day Costco, 1920s

Kapālama, late-1920s. The early footprint for Kamehameha Schools' current campus can be seen on the hillside.

Kapālama was among those lands. A place called Kaiwiʻula in Kapālama was selected as the site for the first Kamehameha Schools campus. It opened as the Kamehameha School for Boys in October of 1887, with five frame houses and thirty-seven students. The school held its inauguration ceremony on November 4, 1887. King David Kalākaua, his wife Queen Kapiʻolani, then-Princess Liliʻuokalani, and Princess Kaiʻulani were among the guests.

The curriculum in the school's early days had a strong vocational and agricultural emphasis. In 1895, for example, the students planted 28,000 huli (taro tops) in the surrounding loʻi. An ʻauwai (water course) diverted water from an upland stream to feed the crops until the mid-1930s. Students also helped run a dairy and piggery until 1925, when it was relocated to Hawaiʻi Kai.

In 1893, the trustees began making preparations for a girls' school. A main hall for the Kamehameha School for Girls was completed in 1894, on a site neighboring the boys' campus, and that November, classes began with approximately fifty students.

By the 1920s, lower Kapālama was no longer the stretch of empty land it had been thirty years prior. A burgeoning neighborhood of homes and businesses bustled around the campus edges. Predicting that the "city streets will eventually dismember the present location," Trustee E. Faxon Bishop and his colleagues prepared for the school's relocation. In December of 1928, they selected the empty hillside just above lower Kapālama as the school's future home.

The School for Girls made the move first, to Kamehameha's present location in Kapālama Heights. Construction began in 1928 along the uppermost slopes, and dedication ceremonies were held on September 13, 1931. It took a few years for the Trust to firm up its footing in the wake of the Great Depression, so preparations to move the School for Boys didn't begin until 1935. It opened in 1940, and unification of the two schools under a common curriculum and co-ed classes came during the 1965-1966 school year.

Kapālama Today

During Hawaiʻi's territorial years, coastal and central Kapālama, along with neighboring Kalihi, evolved into an outer suburb of fast-growing Honolulu. The area is typically lumped together as Kalihi-Kapālama or Kalihi-Pālama.

A Community with Rural Roots

For a time, it was still quite rural. The lands along both sides of the Niuhelewai Stream were extensively farmed at least into the 1920s. Interspersed among the dwellings were loʻi kalo, rice paddies, truck farms, and home gardens.

From George Houghtailing, who grew up in Kapālama near the street that now bears his family name, we have this description of the neighborhood and its residents in the 1920s:

> *Well, the types of people were more of the middle class, made up of primarily part-Hawaiians, Portuguese, and a Chinese settlement. The Chinese settlement particularly were people who were very active in taro cultivation, rice planting, truck gardening, fruit orchards, etc. The small family merchants were located along King Street and School Street. They operated the markets, coffee shop, and restaurants.*

Houghtailing remembers the Kwock Hing Store on the corner of North King Street and Houghtailing Street, several blocks

Dillingham Blvd., near present-day HCC. Kaumakapili Church's steeple can be seen along the lower left. Circa 1934.

west of the canal. It was one of the main shops serving the neighborhood. "And then, as you came along down towards the Kama Lane, Long Lane, Auld Lane area, there were these stores of Chinese coffee shop, small family markets, and grocery stores."

Houghtailing remembers the rice paddies and taro patches being below School Street and extending to Liliha Street.

> *There were several ponds. In later years, several of the ponds were sealed by the Board of Water Supply in order to preserve water. The area between Pālama Street down to what is now Vineyard Street was also planted with taro. These taro patches were still in existence in the mid-20s, when it gave way to residential developments.*

Sugarcane and dairy farming comprised lower Kapālama. The fields were managed by the Honolulu Sugar Company, and the cane would be carried out to its ʻAiea mill by train. The fields stretched from the Waiakamilo/Houghtailing area east as far as the Dole Cannery, makai of Vineyard Boulevard. Operations began phasing out in the late-1920s.

In 1889, Benjamin Dillingham's Oʻahu Railway & Land company opened the eastern depot of its Honolulu-to-Aiea line in Iwilei, near Kūwili fishpond. Businesses in the area quickly began filling the surrounding fishponds with dirt and coral rock, sparking a small construction boom of cheaply built homes and commercial buildings.

In 1907, James Dole relocated his cannery to Iwilei. He suspected that in the city, it would be easier to find the seasonal labor that packing required, which only lasted during the summer months of July and August. Another player in the pineapple industry, Libby, McNeill & Libby, opened its cannery in 1914, near Waiakamilo and Nimitz Highway.

Amidst the canefields was a sports arena called Houston Arena, located midway between King Street and Dillingham Boulevard, on the Diamond Head side of the canal. It's here where many of the days' bootleg boxing fights took place. Boxing was illegal until 1929. The sport was especially popular with the Portuguese, Filipino, and Hawaiian boys, and matches drew enthusiastic, often raucous crowds. Houston Arena shuttered in 1933, when the Honolulu Civic Auditorium opened in Mōʻiliʻili.

A Neighborhoods Takes Shape

One of the first residential subdivision developments in Kapālama was known as the McInerny Tract, located mauka of the canal, a few blocks above School Street, on land that had been planted with pineapple. It was surveyed and subdivided in 1914; the first residents moved in a year later.

The bulk of residential development in the Kalihi-Kapālama area occurred between 1911 and 1920, when approximately forty subdivisions opened up. This period coincides with a wave of Japanese plantation workers moving from the plantations to the city. Back then, they were the area's newcomers, arriving on the heels of the Portuguese and Chinese. Many of the Hawaiian residents were kamaʻāina to Kapālama.

Most of the residential development during this period occurred in areas mauka of King Street and ewa of Kalihi Street, where ground and infrastructure conditions were better.

Houghtailing remembers there being a real sense of community in those early days:

> *Life was very pleasant. [Neighbors] all got along together. They all helped one another. There was always a real community. Gatherings of each other, knowing and talking to each other, and then discussing problems. The areas was big, the holdings of the families were big. And there were not that many. They were not located too close together. So, friendly community spirit.*

In 1920, Honolulu Community College's predecessor, the Territorial Trade School, was established at the site of a Chinese hospital. It was integrated into McKinley High School's curriculum and then later re-established as Honolulu Vocational School.

When the University of Hawaiʻi at Mānoa came under severe growth pressures in the 1960s, the state inaugurated the

Kapālama Basin, 1954

2-year community college system. The Honolulu Vocational School was incorporated into the University of Hawai'i system through the Community College Act of 1964. And in 1966, UH's Board of Regents approved the name Honolulu Community College and authorized the school to grant Associate in Arts and Associate in Science degrees.

The Canal Spurs Growth

Kapālama Canal was built by the City and County of Honolulu with financial assistance from the Federal Public Works Administration program in 1938-39. The canal roughly follows the original course of Niuhelewai Stream to the receiving waters of Honolulu Harbor. It was conceived as a flood prevention measure; the stream's periodic flooding was becoming a nuisance as the surrounding area became more populated.

A February 25, 1939 *Honolulu Star-Bulletin* celebrates the canal's completion:

> *Men, materials and equipment have thrown another barrier between the menace of flood and the lives and property of a flood-threatened district. Kapalama, in years past a sufferer from lack of proper drainage is now flood-safe. Heavy rains which formerly spread their waters unchecked, causing death and destruction, now present no menace to this wide district. An area of 1,145 acres is now protected by 2.6 miles of drainage structures and open canal. Flood waters will now sweep controlled into the sea!*

In the canal's early days, recreational and subsistence uses were common. The waters were comparatively clean back then, and residents would use the canal for swimming, fishing, and crabbing. Water quality began to decline in the late-1960s, early-1970s, as the area's industrial uses intensified. Nevertheless, you can still find fishermen trapping Samoan crabs today.

In 1930, the Honolulu Board of Supervisors decided to widen and improve the increasingly busy Dillingham Boulevard, which connected downtown and the harbor area to the Oahu Belt Road, renamed Kamehameha Highway in 1920. Nimitz Highway wasn't developed until World War II.

Development of lower Kapālama happened during and after the War, which hastened civil work projects at Honolulu Harbor and the surrounding Kapālama Basin.

One early development project was the Kapālama Military Reservation, established in 1941. It was built to function as a wartime shipping facility for the the Armed Forces, but it ended up serving multiple roles, including housing Japanese and Italian prisoners of war.

The state's Department of Transportation acquired the 63-acre parcel in 1990 and used it as a fallback relocation site for any businesses impacted by the government's exercise of eminent domain. Improvements to the site are presently underway to turn it into an overseas container terminal.

It was only after industrial lands in central Honolulu became scarce that the large landholdings in the lower Kapālama became economically attractive to develop. They were subdivided into large lots and turned into the strip malls, warehouses, big box stores, and commercial and industrial complexes we see today.

One of the few remnants of Kapālama's rural past can be found at Lo'i Kalo Park, which abuts the upper canal at School Street.

Not much is known about its pre-contact history. A fresh water spring and large stones along its perimeter are the only carryovers that remain. The stones are arranged in a semi-circle around a large center stone. It's been said that the area was either used as a place of healing and medicine or a meeting place for chiefs.

The fresh water spring still flows. It's fed from two water sources, one at Kunawai Spring near Liliha and the other near the bottom of Kapālama Heights. In the 1970s, the park functioned as a botanical garden; it was a part of Foster Botanical Garden for a short time. It's presently under the care of Nā Hoa Aloha o ka Lo'i Kalo (Friends of the taro patch), a community organization in Kalihi.

APPENDIX B : COMMUNITY STAKEHOLDERS

STAKEHOLDER GROUPS : COMMUNITY

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Pālama Settlement	Iseri	Wayne	President	808-845-3945	wiseri@fhb.com
	Uemori	Brian	First Vice President		info@palamasettlement.org
	Ellis	Aaron	Second Vice President		
	Ito	Jason	Third Vice President		
	Taira	John	Treasurer		
	Nishimoto	Patricia	Secretary		
	Carganilla	Al	Board of Trustees		
	Camp	Catherine	Board of Trustees		
	Ceria	Valentino	Board of Trustees		
	Iwamoto	Raymond	Board of Trustees		
	Kim	Peter	Board of Trustees		
	Moore	Valerie	Board of Trustees		
	Mukai	Stan	Board of Trustees		
	Saito	Paul	Board of Trustees		
	Shin	Su	Board of Trustees		
	Walters	Sherry	Board of Trustees		
	Wassel	Gary	Board of Trustees		
	Rath	Paula	Emeritus Board of Trustees Member		

STAKEHOLDER GROUPS : COMMUNITY

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Kokua Kalihi Valley Comprehensive Family Service	Auyong	Pua	President	808-791-9400	
	Leong	Ryan	Vice President	808-791-9400	
	Kemper	Edward	Secretary	808-791-9400	
	Kusatsu	Thomas	Treasurer	808-791-9400	
	Cobb	Grace			
	Bualuay	Shigeko			
	Fox	Karen			
	Murashige	Rickey			
	Nakamoto	David			
	Pang	Geoffrey			
Hoʻoulu ʻĀina	O'Connor	Kanoa		808-841-7504	aina@kkv.net
	Freitas	Puni		808-841-7504	aina@kkv.net
Charles Judd Community Health Center					
Ke Ola Hou Clinic					
The Gulick Elder Center					
Kalihi Valley Instructional Bike Exchange (KVIBE)					
Honolulu Habitat for Humanity	Murphy	Jim	Executive Director	808-538-7373	jmurphy@honoluluhabitat.org
Bikeshare Hawaiʻi	Mcarney	Lori	CEO	808-347-0833	lori@bikesharehawaii.org
	Trevino	Ben	President & COO	808-225-4725	ben@bikesharehawaii.org

STAKEHOLDER GROUPS : COMMUNITY

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Hawai'i Bicycling League	Taniguchi	Chad	Executive Director	808-735-5756	bicycle@hbl.org
Honolulu Badminton Club				808-498-9073	honolulubc@gmail.com
Kalihi Community Center				808-330-7108	
Kalihi-Pālama Health Center	Kintu	Emmanuel	CEO & Executive Director	808-848-1438	admingroup@kphc.org
	Sato	Darrin	COO	808-848-1438	admingroup@kphc.org
	Sugimoto	Liane	CFO	808-848-1438	admingroup@kphc.org
Kalihi YMCA				808-848-2494	info@ymcahonolulu.org
Historic Hawai'i Foundation	Faulkner	Kiersten	Executive Director	808-523-2900	kiersten@historichawaii.org
	Gumapac	Tanya	Preservation Associate	808-523-2900	tanya@historichawaii.og
	Iwata	Beth	Director of Operations	808-523-2900	beth@historichawaii.org
Nā Hoaloha O Ka Lo'i Kalo	Ng	Darryn		808-842-0606	
Kalihi Ahupua'a Ulu Pono Ahahui (KAUPA)	Laeha	David Kaohu	President		kaupa@googlegroups.com
	Crockett	Charmaine	Vice President		kaupa@googlegroups.com
	Duduoit	Chana			kaupa@googlegroups.com
Outdoor Circle	McFarlane	Mike	President	808-593-0300	mail@outdoorcircle.com
	Aluli	Yuklin	Vice President	808-593-0300	mail@outdoorcircle.com
Trust for Public Land	Hong	Lea	Director		Hawaii@tpl.org

STAKEHOLDER GROUPS : CULTURAL

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Bishop Museum	Farm	LindaLee Ku'uleilani	Interim President & CEO		lindalee@bishopmuseum.org
PA'I Foundation	Takamine	Vicky Holt	Executive Director	808-754-2301	vtakamine@gmail.com
Queen Lili'uokalani Trust Children's Center	Gorospe	Ku'uipo	Administrative Assistant	808-847-1302	
	Kahalepuna	Wendy	Property/Risk Managment Specialist	808-847-1302	
	Kauahi	Dennis	Kupuna Ho'ohana	808-847-1302	
	Cobb	Raynelle	Human Resources Manager	808-847-1302	
Kalihi-Pālama Hawaiian Civic Club	Khan	Leimomi	Pelekikena	808-372-0630	mkhan@hawaiiantel.net
	Namu'o	Clyde	Hope Pelekikena	808-372-0630	
	Heleloa	Ladd	Pu'uku	808-372-0630	
	Soa	Dexter	IP Pelekikena	808-372-0630	
	Duarte	Cedric	Kakau Mo'olelo (Rec. Sec)	808-372-0630	
Puerto Rican Heritage Society of Hawai'i				808-847-2751	
Kalihi Pālama Culture & Arts				808-521-6905	info@kpcahawaii.com
Family Ties to Mokauea Island	Kupihea	Kehaulani	Anthropologist		Mokauea@gmail.com

STAKEHOLDER GROUPS : EDUCATION

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Honolulu Community College	Lacro	Erika	Chancellor	808-845-9225	lacro@hawaii.edu
Farrington High School	Carganilla	Alfredo	Principal	808-305-5000	
Damien Memorial	Casey	Daniel	CFC- Principal	808-841-0195	dcasey@damien.edu
Kalākaua Middle School	Aiwohi	Lorelei	Principal	808-832-3130	Lorelei_Aiwohi@hawaiidoe.org
Kalihi Kai Elementary School	Vines	Laura	Principal	808-832-3322	Laura_Vines@hawaiidoe.org
Kapālama Elementary	Dang	Patricia	Principal		Patricia_dang@hawaiidoe.org
Ka'iulani Elementary School	Puletasi	Jill	Principal	808-832-3160	Jill_puletasi@hawaiidoe.org

STAKEHOLDER GROUPS : LANDOWNERS / DEVELOPERS

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
DHHL	Masagatani	Jobie	Chair	808-620-9456	
	Aila	William	Deputy of the Chair	808-620-9456	
	Chinn	Linda	Administrator	808-620-9456	Linda.L.Chinn@hawaii.gov
Kamehameha Schools	Theommes	Walter			watheomm@ksbe.edu
	Camp	Cathy			cacamp@ksbe.edu
	Gi	Sharon			shgi@ksbe.edu
University of Hawai'i	Ching	Carlton	Director of Land Development	808-356-8109	cching77@hawaii.edu
Department of Transportation Services	Garrity	Mark	Deputy Director		
	Formby	Michael	Director		
Hawai'i Public Housing Authority	Fo	Stephanie		808-832-5961	hpha@hawaii.gov
	Ouansafi	Hakim	Executive Director	808-832-5961	
Castle & Cooke Hawai'i	Barrett	Bruce	Executive VP		barrett@castlecooke.com
Kōkea Gardens	Properties	Cen Pac	Property Manager		
SKK Enterprises	Ross	Margaret			
Stanford Carr Development	Carr	Stanford			scarr@stanfordcarr.com
	Peralta	Stacie			stacie@stanfordcarr.com

STAKEHOLDER GROUPS : BUSINESSES

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Il Gelato Hawai'i	Koeppenkastrop	Dirk	Co-owner	808-542-9276	info@ILGelato-Hawaii.com
	Lueker	Nicole	Co-owner	808-542-9276	info@ILGelato-Hawaii.com
Ferguson				808-832-7473	
D'Otani Produce	Otani	Dwight	Owner	808-832-9600	
Hawai'i News Now				808-847-1112	
Fiberglass Hawai'i				808-847-3951	sales@fiberglasshawaii.com
Honolulu Ford Lincoln				808-532-1700	
Helena's Hawaiian Food	Katsuyoshi	Craig	Owner	808-845-8044	
	Katsuyoshi	Kalei	Owner	808-845-8044	
Watanabe Floral	Watanabe	Russell	Owner	808-845-8044	
Hawai'i Federal Credit Union				808-847-1371	
Princess Ka'iulani Fashions	Jill	Anderson	Owner	808-847-4806	pfk@pkaiulanifashions.com
Kalihi Pet Center				808-841-5234	kalihipetcenter.com
Koaloha Ukulele				808-847-4911	
Dream to Dance				808-372-5574	hello@dreamtodance.com
Kamehamhea Bakery	Paglinawan	Geramie	Owner	808-845-5831	
Young's Fish Market	Young	Wilfred & Charlotte	Owners	808-841-4885	
Territorial Savings Bank				808-8456940	
Lox of Bagels	Drake	Terumi	President/Owner	808-200-7259	loxofbagels@gmail.com

STAKEHOLDER GROUPS : BUSINESSES

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
J&E Fishing Supplies					
Pālama Market				808-847-4427	
Pau Hana Lounge	Kaiama	Javan	Owner		
Cheers Station				808-841-9977	
Sen Plex Corporation				808-848-0111	
Homeowners Design Center				808-847-0216	
Kahala Floors				808-847-0216	
Zippy's Dillingham				808-832-1750	
Elvin's Bakery				808-848-8118	
Hawai'i Hochi	Yempuku	Paul S	President and Publisher	808-845-2255	editorial@thehawaiihochi.com
Savers					
Office Depot					
Foodland					
Hawai'i Federal Credit Union				808-847-1371	
POP Fishing & Marine	Martin	Sean	President	808-537-2905	sales(at)pop-hawaii.com
	Cook	Jim	Vice President	808-537-2905	sales(at)pop-hawaii.com
Nico's	Chaize	Nico	Owner/Chef	808-540-1377	customerservice@nicospier38.com
Uncle's Fish Market	Johnson	Bruce	Founder	808-275-0063	

STAKEHOLDER GROUPS : RELIGIOUS GROUPS

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Independent Baptist Church	Ching	Kam	Pastor	808-282-2831	ibckc@yahoo.com
Kaumakapili United Church of Christ*	Hirano	David	Rev.	808-848-1545	kaumakapili@yahoo.com
	Kaupu	David	Kahu- Retired	808-595-8528	kskahu@yahoo.com
St Elizabeth's Episcopal Church	Gierlach	David	Rev.	808-845-2112	david.gierlach@gmail.com
	Crosier	Katherine	Parish Administrator	808-845-2112	stelizabethhawaii@gmail.com
Ka Makua Mau Loa Church				808-845-2897	
Korean Baptist Church					
Hawai'i First Samoan Assembly				808-847-6335	
Hawai'i Kotohira Jinsha-Hawai'i Dazaifu Tenmangu				808-841-4755	kotohira@hawaiiantel.net
Bluewater Mission				808-744-2312	

STAKEHOLDER GROUPS : GOVERNMENT AGENCIES

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
DPP Transit-Oriented Development	Tang	Andrew	Planner		andrew.tang@honolulu.gov
HART	Souki	Jesse	Director, Planning, Permitting & Right-of-Way	808-566-2299	jesse.souki@honolulu.gov
State Board of Water Supply	Miyashiro	Duane	Chair	808-748-5000	contactus@hbws.org
	Wong	Adam	Vice Chair	808-748-5000	contactus@hbws.org
State Department of Land and Natural Resources	Case	Suzanne	Chairperson	808-587-0400	dlnr@hawaii.gov
City Department of Parks and Recreation	Nekota	Michele	Director	808-768-3003	mnekota@honolulu.gov
	Ishikawa	Jeanne	Deputy Director	808-768-3003	jishikawa1@honolulu.gov
City Department of Planning and Permitting	Atta	George	Director	808-768-8000	
	Challacombe	Arthur	Deputy Director	808-768-8000	
Honolulu Police Department	Kealoha	Louis	Chief	808-529-3162	
	Kajihiro	Dave	Deputy Chief	808-529-3162	
	McCauley	Marie	Deputy Chief	808-529-3162	
UH Sea Grant UH Sea Grant	Lerner	Darren	Director	808-956-7031	lerner@hawaii.edu
	Okimoto	Darren	Associate Director	808-956-7031	okimotod@hawaii.edu
Hawai'i Housing Finance and Development Corporation	Hirai	Craig	Executive Director	808-587-0620	webmaster@dbedt.hawaii.gov
US Army Corps of Engineers	Namizu	Joy		808-835-4004	CEPOH-PA@usace.army.mil
US Fish and Wildlife Service				808-792-9400	Pifo_admin@fws.gov
US Environmental Protection Agency					

STAKEHOLDER GROUPS : GOVERNMENT AGENCIES

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
State Department of Motor Vehicles/ Customer Services	Kajiwara	Sheri T.	Director		
	Leong	Randy	Deputy Director		
State Department of Transportation	Fuchigami	Ford	Director	808-587-2150	
DOT Statewide Transportation Planning Office				808-831-7973	
State Department of Transportation Harbors Division	Young	Darrell T	Deputy Director	808-587-3651	
	Kalili	Dre	Deputy Secretary	808-587-3651	
City Department of Facilities Mantainenace	Sasamura	Ross	Director and Chief Engineer	808-768-3343	rsasamura@honolulu.gov
City Department of Accounting and General Services	Kroning	Robert	Director	808-768-8480	rkroning@honolulu.gov
City Department of Transportation Services	Formby	Michael	Director	808-768-8303	mformby@honolulu.gov
	Garrity	Mark	Deputy Director		mgarrity@honolulu.gov

STAKEHOLDER GROUPS : ELECTED OFFICIALS

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
District 7 City Council	Manahan	Joey	Council Member	808-768-5007	jmanahan@honolulu.gov
	Arakaki	Dennis	Community Liaison		darakaki2@honolulu.gov
State House	Luke	Sylvia	REP. District SH-HI025	808-586-6200	repluke@capitol.hawaii.gov
	Saiki	Scott	Rep. District SH-HI026	808-586-8485	repsaiki@capitol.hawaii.gov
	Ohno	Takashi	Rep. District SH-H1027	808-586-9415	repmizuno@capitol.hawaii.gov
	Rhoads	Karl	Rep. District SH-HI029	808-586-6010	reprhoads@capitol.hawaii.gov
	Cachola	Romi	Rep. District SH-HI030	808-586-6130	repcachola@capitol.hawaii.gov
	Oakland	Susie Chun	Sen. District SS-HI013	808-586-6130	senchunoakland@capitol.hawaii.gov
	Kim	Donna	Sen. District SS-HI014	808-587-7200	senkim@capitol.hawaii.gov
	Wakai	Glenn	Sen District SS-HI015	808-587-7200	senwakai@capitol.hawaii.gov
Kalihi-Pālama Neighborhood Board NO. 15	Mandado	Ryan	Chair		ryan_mandado@yahoo.com
	Guerrero	Donald	2nd Vice Chair	503-882-9349	Uncle4257@yahoo.com
	Cummings	Teresa	Treasurer	808-841-0193	
	Dayao	Firmo		808-339-6626	dayaofo@msn.com
	Dumayag	Joe			joeduma003@gmail.com
	Kamahele	Mark		808-489-2316	
	Medeiros	Crystal		808-306-7624	Aulani86@gmail.com
	Sagadraca	Jonan			
	Ybanez	Amanda		808-941-2141	
	Erb	Robert		808-497-6920	boberb2@yahoo.com

STAKEHOLDER GROUPS : ELECTED OFFICIALS

ORGANIZATION	Last Name	FIRST NAME	TITLE	PHONE	EMAIL
Kalihi Valley Neighborhood Board NO. 16	Wong	Chrisotpher	Chair	808-778-9855	Cwong@nbh@gmail.com
	McDonald	Michael	Vice Chair		mmcdonald.nhb@gmail.com
	Kamano	Cain	2nd Vice Chair		cain_kamano@hotmail.com
	Koga	Chester	Secretary	808-551-4969	chesterkoga@yahoo.com
	Nagaishi	Jack	Treasurer		longstonejack@yahoo.com

APPENDIX C : GEOTECHNICAL WORK PLAN

Work plan will be refined following review of concept design and civil improvement options.

The project site comprises approximately one-mile of Kapālama Canal between the first canal fork just mauka of the H-1 Freeway and Nimitz Highway. Kapālama Canal is a channelization of the more urbanized downstream portion of Kapālama Stream, and outlets into Mamala Bay. Kohou Street and Kōkea Street run parallel to the Canal on the ʻewa and diamond head sides, respectively, and several drainage utilities outlet into the Canal. The horizontal distance from the nearest edge of these paved streets to the water line varies from about 15 to 30 feet.

The Canal is approximately 100 feet wide from water line to water line with typical water depth on the order of 5 feet. During site walk observations, we noted the Canal slopes are largely vegetated. Previous geotechnical reporting (1979) indicated the existing earthen banks south of North King Street were 1H:1V or steeper. The report proposed options for retaining structures south of North King Street; however, it appears that the earthen banks were maintained. During our site visit we observed the planned concrete reinforced masonry (CRM) retaining wall structures were implemented north of North King Street.

The previous geotechnical report (1979) includes borehole data between North King Street and Nimitz Highway. Boreholes extended up to 35 feet below ground surface and indicated the following stratigraphic sequence:

- Surface Crust / Misc. Fill – 2 to 7 feet thick
- Soft Gray Sandy Silt or Clay with coral fragments (water bearing) – 0 to 27 feet thick
- Stiff Brown Silty Clay – top of layer from 5 to 29 feet below ground surface (bgs)
- Loose to Medium-Dense Tan Clayey Coral and decomposed coral – top of layer from 10 to over 30 feet bgs

There is considerable variability in consistency and elevation of the potential load bearing strata. Additional ground investigation, laboratory testing, and geotechnical reporting will be necessary to support design of civil and structural improvements near and (if proposed) within the Canal itself. The extent and depth of investigation and testing, and the types of methods used, will depend upon the design options under consideration. Outlined below are geotechnical requirements we envisage may be associated with different design elements.

Civil improvements and minor structures not affecting the Canal

Civil improvements such as new pavements and underground utilities, and foundations for one-story structures and ground bearing slabs, may require test pits to identify soil conditions, obtain samples for soil classification, identification of soft soils, compaction testing, and subgrade design parameters such as California bearing ratio and modified proctor testing. In locations of greater structural loads, shallow boreholes with Standard Penetration Testing (SPT) or Cone Penetration Tests (CPTs) may be required to define the strength and thickness of the soft gray clay. Drainage design may require soil infiltration testing.

Civil or Structural improvements to the Canal

The design of Canal improvements, hydraulic modelling, and erosion studies may require sampling and testing of soils comprising the earthen banks and the base of the Canal. Earth retention structures may be proposed to provide a wider horizontal surface for public space, requiring significant cut and fill. Boreholes (with SPTs and other sampling as appropriate) up to 30 feet in depth at regular intervals may be necessary to confirm and supplement existing data. Boreholes should extend at least two-times deeper than the height of soil to be retained (three-times retained height from the surface). Lab testing such as oedometer tests would be undertaken to determine susceptibility of softer soils to long term settlement.

Bridge or platform structures over the Canal

Civil improvements may include pedestrian bridge crossings or promenade structure extending partly over the earth bank and/or Canal. Such structures could be designed as single spans or cantilever platforms to minimize disturbance to the Canal. Construction of piers would require temporary earth berms for construction access, unless depth of water is sufficient to support waterborne installation of piles. Foundations for such structure would likely require deeper boreholes (50 feet or more) to confirm bearing strata to a suitable depth.

A list of Technical Standards for methods and tests that may be applicable to the geotechnical investigations of this project are provided further below.

Once the concept design is completed, these general geotechnical investigation recommendations should be developed into a detail scope of work to be procured and executed to support of design development. It is understood that the Canal is under US Army Corps of Engineers jurisdiction, and proposed ground investigations (as well as design affecting the Canal itself) should be coordinated with the Corps as needed.
It is important that the geotechnical design engineer review ground investigation proposals and be present during the investigation to observe and direct the exploration program.

Potentially relevant standards for field investigation and laboratory testing include:

- ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))
- ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
- ASTM D 1586 Penetration Test and Split-Barrel Sampling of Soils
- ASTM D 1587 Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
- ASTM D 1883 Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils
- ASTM D 2113 Rock Core Drilling and Sampling of Rock for Site Investigation
- ASTM D 2487 Classification of Soils for Geotechnical Engineering Purposes

- ASTM D 2573 Standard Test Method for Field Vane Shear Test in Cohesive Soil
- ASTM D 4220 Standard Practices for Preserving and Transporting Soil Samples
- ASTM D 4429 Standard Test Method for CBR (California Bearing Ratio) of Soils in Place
- ASTM D 5079 Preserving and Transporting Rock Core Samples
- ASTM D 3385 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer
- ASTM D 5093 Standard Test Method for Field Measurement of Infiltration Rate Using Double-Ring Infiltrometer with Sealed-Inner Ring
- ASTM D 5778 Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils
- ASTM D 6391 Standard Test Method for Field Measurement of Hydraulic Conductivity Using Borehole Infiltration
- ASTM D 6430 Standard Guide for Using the Gravity Method for Subsurface Investigation
- ASTM D 6951 Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications.
- ASTM G 57 Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method
- ASTM C1580, "Standard Test Method for Water-Soluble Sulfate in Soil."
- ASTM D422, "Standard Test Method for Particle-Size Analysis of Soils."
- ASTM D854, "Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer."
- ASTM D1140, "Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve."
- ASTM D1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 [2,700 kN-m/m3])."
- ASTM D1883, "Standard Test Method for CBR (California Bearing Ratio) of Laboratory- Compacted Soils."
- ASTM D2216, "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock."
- ASTM D2435, "Standard Test Method for One-Dimensional Consolidation Properties of Soils."
- ASTM D2850, "Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils."
- ASTM D2974, "Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils."
- ASTM D3080, "Standard Test Method for Direct Shear Test of Soils under Consolidated Drained Conditions."
- ASTM D4318, "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils."

- ASTM D4546, "Standard Test Methods for One-Dimensional Swell or Settlement Potential of Cohesive Soils."
- ASTM D4644, "Standard Test Method for Slake Durability of Shales and Similar Weak Rocks."
- ASTM D4767, "Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils."
- ASTM D4829, "Standard Test Method for Expansion Index of Soils."
- ASTM D4972, "Standard Test Method for pH of Soils."
- ASTM D5084, "Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter."
- ASTM D5731, "Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications."
- ASTM D6467, "Standard Test Method for Torsional Ring Shear Test to Determine Drained Residual Shear Strength of Cohesive Soils."
- ASTM D6528, "Standard Test Method for Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils."
- ASTM D7012, "Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures."
- ASTM D7181, "Method for Consolidated Drained Triaxial Compression Test for Soils."
- ASTM G51, "Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing."
- ASTM G162, "Standard Practice for Conducting and Evaluating Laboratory Corrosions Tests in Soils."
- ASTM G187, "Standard Test Method for Measurement of Soil Resistivity Using the Two-Electrode Soil Box Method."
- ASTM G200, "Standard Test Method for Measurement of Oxidation-Reduction (ORP) of Soil."