

Wetland Waters of the U.S. Study Honolulu High-Capacity Transit Corridor Project

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Prepared for:
City and County of Honolulu

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Wetland and Waters of the U.S. Study

1.0 Executive Summary

This Wetland and Waters of the U.S. Study was conducted for the Honolulu High-Capacity Transit Corridor Project (Project) over the approximately 20-mile-long project for both the Airport and Salt Lake Alignments from East Kapolei to Ala Moana Shopping Center. The study area encompassed approximately a 250-foot survey area (either side of the centerline) of the Project. This survey was conducted to examine areas that may be waters of the U.S. and are under the jurisdiction of the U.S. Army Corps of Engineers (USACE) as per Section 404 of the Clean Water Act of 1972 (USC 1972) and/or Section 10 of the Rivers and Harbors Act of 1899 (USC 1899). The combination of field surveys and background research resulted in the identification of 26 sites that currently display one or more characteristic (i.e., wetlands, streams, open waters) of a water of the U.S. and five sites that did not exhibit any characteristics of a water of the U.S. for a total of 31 examined sites.

Due to the magnitude and intricacies of the Project, the identified sites were sorted into five categories (Categories I–V) based on the type of waters of the U.S. and the potential impact that may occur at the site as a result of the Project (Table 1). The potential impacts are summarized based on the information available at the time of this Study and are not reported in quantifiable amounts (i.e., acres, square feet, cubic yards per foot). Anticipated impacts will be quantified in the Final EIS based on the Preliminary Alignment Plans and Profiles, June 2009. As design is finalized, the amount and type of impact will be further detailed and included in the Section 404 permit application.

The identification and delineation of waters of the U.S. within and/or adjacent to the Project was done in accordance with the USACE *Wetlands Delineation Manual* (USACE 1987). In addition, the USACE *Jurisdictional Determination Form Instructional Guidebook* (USACE 2007) was consulted to assist in the preliminary evaluation of an identified site's potential to be jurisdictional waters of the U.S. However, the findings presented herein do not attempt to presume which of the identified waters of the U.S. may be under the jurisdiction of the USACE. This study was prepared as an informational tool to assist the USACE in the evaluation of the identified waters of the U.S. within and/or adjacent to the Project.

Table 1. Summary of Site Description and Impacts

Site No.	Site Name	Approximate Coordinate Data (Lat/Long)	Type of Water	Tidally Influenced	Potential Impacts ¹
<i>Category I—Sites studied that are not waters of the U.S.</i>					
3	Honouliuli-Aloun Farms	21° 22' 18.504" N, 158° 2' 21.762" W	N/A	N/A	None
5	Upper West Loch Golf Course	21° 22' 28.120" N, 158° 1' 48.376" W	N/A	N/A	None
8	Kalapawai Junction with Waikele	21° 22' 57.300" N, 158° 0' 36.000" W	N/A	N/A	None
11A	Maintenance and Storage Facility near Leeward Community College (maintenance facility)	21° 23' 31.472" N, 157° 59' 16.770" W	N/A	N/A	None
21	North of Aloha Stadium	21° 22' 31.097" N, 157° 55' 56.112" W	N/A	No	None
<i>Category II—Concrete-lined channel waters of the U.S. spanned by the Project</i>					
6	Hō'ae'ae Stream	21° 22' 45.000" N, 158° 1' 15.000" W	Non-RPW	No	Shading
7	Waikele Stream	21° 22' 59.000" N, 158° 0' 39.000" W	RPW	Yes	Shading
10	Waipahu Canal Stream	21° 23' 5.400" N, 158° 0' 3.000" W	RPW/TNW	Yes	Shading
14	Pearl City Stream	21° 23' 36.000" N, 157° 58' 7.000" W	Non-RPW	No	Shading
19	'Aiea Stream	21° 22' 37.177" N, 157° 56' 3.884" W	RPW	Yes	Shading
23	Hālawā Stream (Mauka-Salt Lake)	21° 22' 4.000" N, 157° 55' 48.000" W	RPW	No	None ²

Site No.	Site Name	Approximate Coordinate Data (Lat/Long)	Type of Water	Tidally Influenced	Potential Impacts ¹
<i>Category III—Modified and unmodified channel waters of the U.S. spanned by the Project</i>					
4	Honouliuli Stream	21° 22' 27.000" N, 158° 2' 0.000" W	RPW	No	Shading/Clearing
9	Kapakahi Stream	21° 23' 0.600" N, 158° 0' 23.500" W	RPW	No	Shading
18	Kalauao Stream	21° 22' 50.600" N, 157° 56' 25.000" W	RPW	No	Shading
28	Kalihi Stream	21° 19' 58.384" N, 157° 53' 16.944" W	TNW	Yes	Shading
31	Pānakauahi Gulch	21° 24' 4.300" N, 157° 59' 18.000" W	Non-RPW	No	Shading
<i>Category IVA—Freshwater Wetlands proximate to the Project</i>					
15	Waiau Springs and Wetland	21° 23' 22.226" N, 157° 57' 30.757" W	RPW/wetland	No	No impacts anticipated with BMPs during construction
17	Kalauao Springs—Sumida Watercress Farm	21° 22' 55.000" N, 157° 56' 35.000" W	RPW / Wetland	No	No impacts anticipated with BMPs during construction/Shading
25	Aolele Ditch (Airport)	21° 19' 57.146" N, 157° 54' 21.769" W	Non-RPW/Wetland	No	Shading
<i>Category IVB—Mangrove Wetlands proximate to the Project</i>					
11B	Maintenance and Storage Facility near Leeward Community College (stormwater outfall to Pearl Harbor)	21° 23' 17.896" N, 157° 59' 16.079" W	TNW/Wetland	Yes	No impacts anticipated with BMPs during construction
16	Waimalu Stream	21° 23' 10.213" N, 157° 57' 8.523" W	RPW/Wetland	Yes	Shading
20	'Aiea Bay State Recreation Area	21° 22' 32.434" N, 157° 56' 2.071" W	Wetland	Yes	None
22	Hālawā Stream (Makai-Airport)	21° 21' 54.000" N, 157° 56' 14.000" W	TNW/Wetland	Yes	Shading
26	Kahauiki Stream	21° 20' 11.225" N, 157° 53' 36.128" W	RPW/ Wetland	Yes	None ²

Site No.	Site Name	Approximate Coordinate Data (Lat/Long)	Type of Water	Tidally Influenced	Potential Impacts ¹
<i>Category V—Structural elements of the Project in waters of the U.S.</i>					
1	Lower Kalo'i Gulch	21° 20' 54.470" N, 158° 3' 20.183" W	Non-RPW	No	Fill, clearing, re-locate gulch (park-and ride lot for East Kapolei station)
2	Upper Kalo'i Gulch	21° 21' 38.797" N, 158° 3' 11.160" W	Non-RPW	No	Fill (guideway support columns, shading and clearing)
12	Waiawa Stream	21° 23' 48.761" N, 157° 58' 56.918" W	RPW	No	Fill (guideway support columns near stream, shading and clearing)
13	Waiawa Springs	21° 23' 47.697" N, 157° 58' 48.063" W	RPW	No	Fill (bus transit center columns, shading and clearing)
24	Moanalua Stream (Mauka-Salt Lake)	21° 20' 34.000" N, 157° 53' 40.000" W	RPW	Yes	None ²
27	Moanalua Stream (Makai-Airport)	21° 19' 59.467" N, 157° 53' 37.211" W	RPW	Yes	Fill (guideway support columns, shading and clearing)
29	Kapālama Canal Stream	21° 19' 19.000" N, 157° 52' 23.000" W	TNW	Yes	Fill (extend 4 existing piers and abutments to widen bridge, shading and clearing)
30	Nu'uuanu Stream	21° 18' 48.000" N, 157° 51' 54.000" W	TNW	Yes	Fill (guideway support columns near stream, shading and clearing)

¹Impacts are based on potential impacts that may occur to waters of the U.S., at an individual site, due to anticipated construction and build activities. The actual impact area (i.e., amount of fill, temporary impacts from construction activities) will be reported once the final design has been developed.

²Site located along Salt Lake Alternative studied in Draft EIS—not impacted by Project.

N/A = not applicable

BMPs = best management practices

RPW = relatively permanent waters

TNW = traditional navigable waters

2.0 Project Description

The Project will include the construction and operation of a primarily grade-separated fixed guideway transit system between East Kapolei and Ala Moana Center (Airport Alternative as shown in Figure 1 through Figure 4). All parts of the system will either be elevated in existing transportation right-of-way or in exclusive right-of-way or easement. Steel-wheel-on-steel-rail transit technology has been selected through a comparative process based on the ability of various transit technologies to cost-effectively meet project requirements.

The Project will begin by following North-South Road and other future roadways to Farrington Highway. Proposed station locations and other project features in this area are shown in Figure 1. The guideway will follow Farrington Highway Koko Head on an elevated structure and continue along Kamehameha Highway to the vicinity of Aloha Stadium (Figure 2).

The Project will continue along Kamehameha Highway makai past Aloha Stadium to Nimitz Highway and turn makai onto Aolele Street and then follow Aolele Street Koko Head to reconnect to Nimitz Highway near Moanalua Stream and continue to the Middle Street Transit Center (Figure 3). Stations will be constructed at Aloha Stadium, Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive.

Koko Head of Middle Street, the guideway will follow Dillingham Boulevard to the vicinity of Ka'aahi Street and then turn Koko Head to connect to Nimitz Highway in the vicinity of Iwilei Road.

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

Planned extensions would connect at both ends of the corridor. At the Wai'anae end of the corridor, the alignment would follow Kapolei Parkway to Wākea Street and then turn makai to Saratoga Avenue. The guideway would continue on future extensions of Saratoga Avenue and North-South Road. At the Koko Head end of the corridor, the alignment would veer mauka from Ala Moana Center to follow Kapi'olani Boulevard to University Avenue, where it would again turn mauka to follow University Avenue over the H-1 Freeway to a proposed terminal facility in UH Mānoa's Lower Campus. A branch line with a transfer point at Ala Moana Center or the Hawai'i Convention Center into Waikīkī would follow Kalākaua Avenue to Kūhiō Avenue to end near Kapahulu Avenue (Figure 4).

The total guideway length for this alternative will be approximately 20 miles and include 21 stations. The eventual guideway length, including planned extensions, for this alternative would be approximately 29 miles and include 33 stations.

In addition to the guideway and transit stations, the Project will require the construction of supporting facilities, including a maintenance and storage facility, transit centers, park-and-ride lots, and traction power substations. The maintenance and storage facility will either be located between North-South Road and Fort Weaver Road or near Leeward Community College (Figure 1 and Figure 2). Some bus service will be reconfigured to transport riders on local buses to nearby fixed guideway transit stations. To support this system, the bus fleet will be expanded.

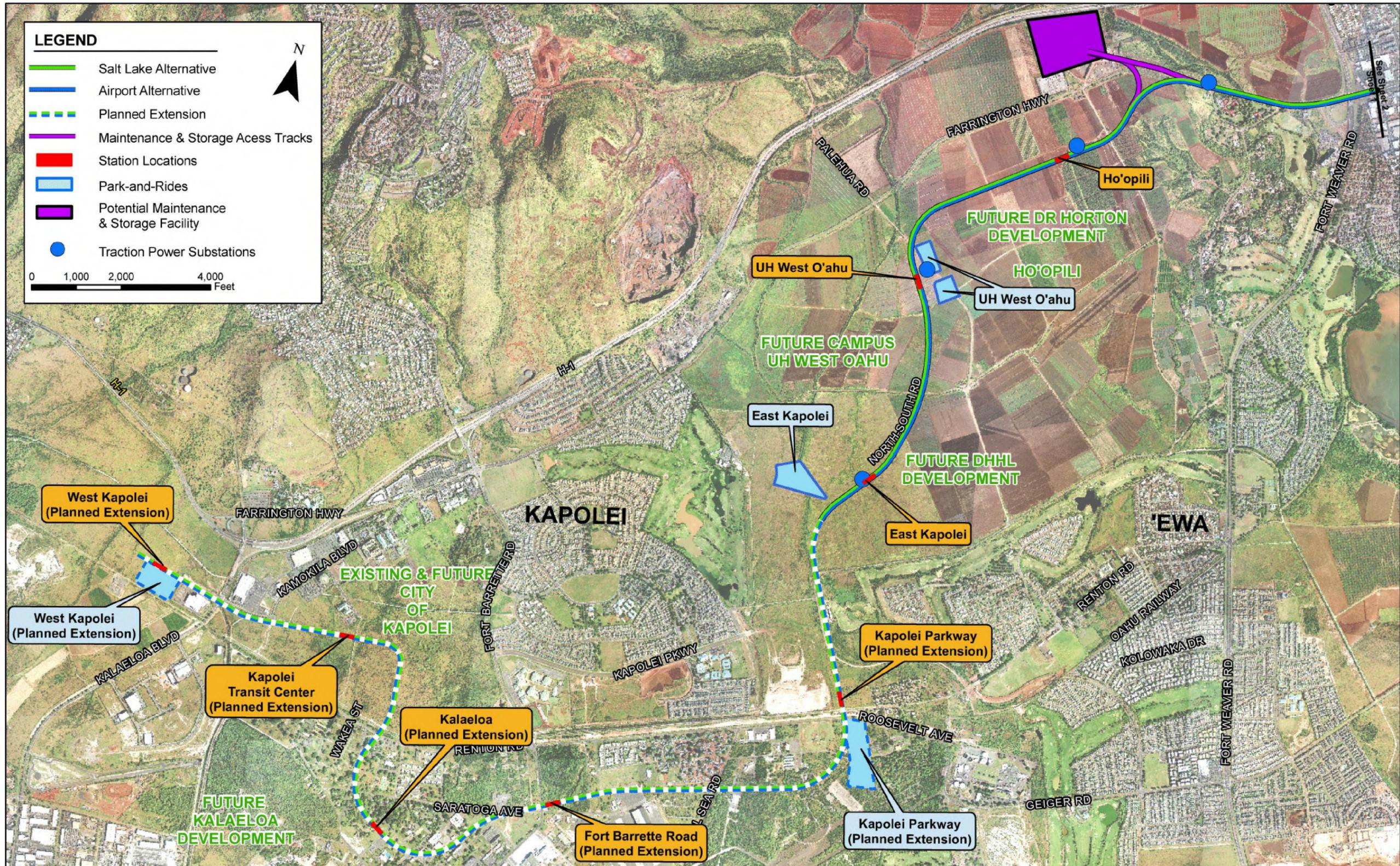


Figure 1. Project Features (Kapolei to Fort Weaver Road)

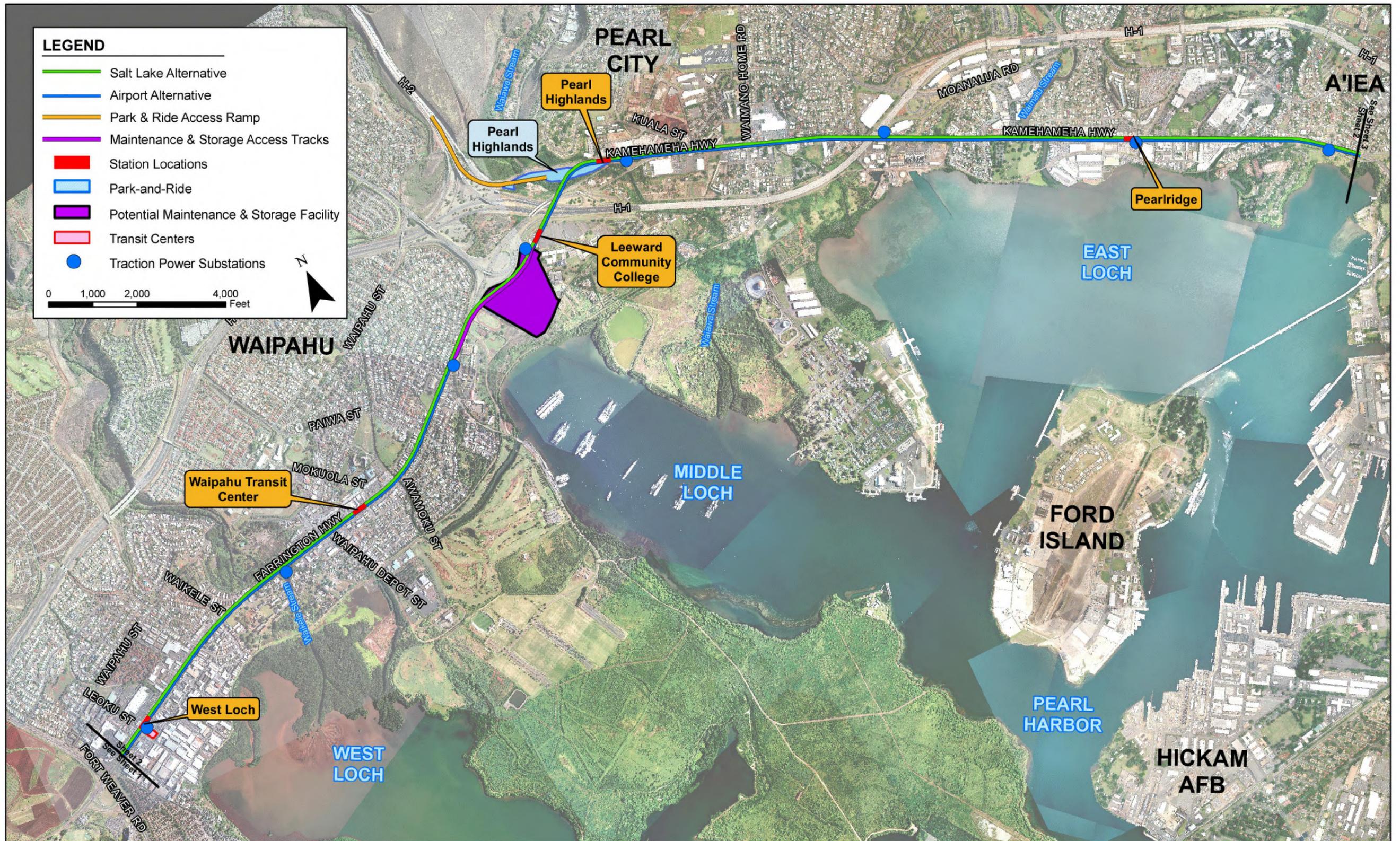


Figure 2. Project Features (Fort Weaver Road to Aloha Stadium)

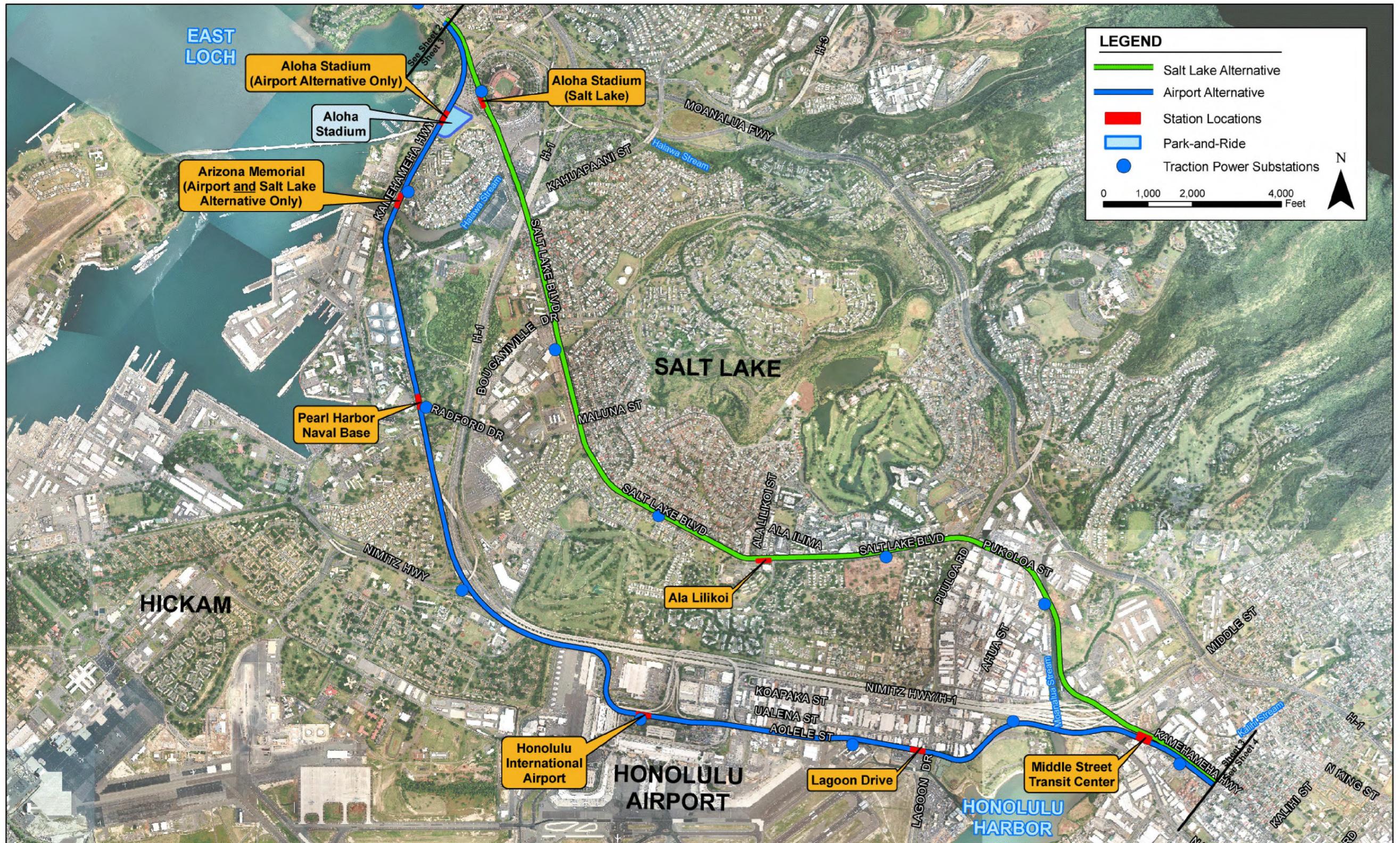


Figure 3. Project Features (Aloha Stadium to Kalihi)



Figure 4. Project Features (Kalihi to UH Mānoa)

3.0 Introduction

The initial submittal of the *Honolulu High-Capacity Transit Corridor Project Wetland and Waters of the U.S. Study*, Honolulu High-Capacity Transit Corridor Project, dated May 12, 2009 (RTD 2009a), and revised submittal of the *Honolulu High-Capacity Transit Corridor Project Wetland and Waters of the U.S. Study*, dated May 21, 2009 (RTD 2009b), were to provide information to the USACE for the purpose of obtaining an approved jurisdictional determination on the identified waters of the U.S. within and/or adjacent to the Project. However, based on the following, it was determined that the preliminary jurisdictional determination approach was more appropriate for this Project.

- May 29, 2009, letter from the USACE (Corps File No. POH-2007-00127), regarding complexities of the Project (i.e., portions are design-build)
- July 2, 2009, meeting with the USACE

Therefore, the intent of this revised study is to clarify the methods, procedures, and materials used to identify and delineate waters of the U.S. within and/or adjacent to the Project during the on-site field surveys. This study also details and documents those identified waters of the U.S. within and/or adjacent to the Project that may be under the jurisdiction of the USACE under Section 404 of the Clean Water Act of 1972 (CWA) (USC 1972) and/or Section 10 of the Rivers and Harbors Act of 1899 (RHA) (USC 1899).

In addition, this study serves to provide the USACE with the currently known potential impacts to waters of the U.S. as a result of the Project. The potential impacts are summarized based on the information available at the time of this Study and are not reported in quantifiable amounts (i.e., acres, square feet, cubic yards per foot). Anticipated impacts will be quantified in the Final EIS based on the Preliminary Alignment Plans and Profiles, June 2009. As design is finalized, the amount and type of impact will be included in the Section 404 permit application. The following sections describe the methodologies and materials used to conduct and complete the field activities and the results of the field activities. This study includes a discussion of the methodology to identify waters and wetlands and determine the ordinary high water mark (OHWM). It also provides a summary of the sites by categories that relate to potential impacts of the Project on waters of the U.S.

Appendix A of this study includes a site description for each of the 31 sites. The site information provided for each site includes: site description, site summary, potential impacts, USGS topographic map, photographs of site, routine wetland determination form(s), and an aerial site drawing. Appendix B includes preliminary plans and profiles of the Project for the locations examined in this study.

4.0 Methodology

A field team consisting of at least one botanist and one aquatic biologist conducted field surveys along the entire corridor of the Project to document site conditions and delineate the observed waters of the U.S. The following sections describe the materials, methods, and procedures used during the field surveys to document and delineate identified waters of the U.S. within and/or adjacent to the Project.

4.1 Site Selection

A desktop review of various resources was conducted to evaluate the potential presence/absence of waters of the U.S. within the Project study area (250 feet either side of centerline). The examined resources included, but are not limited to, the National Resources Conservation Service (NRCS) soils survey (NRCS 2009) which provided information on mapped soil types of an area (including hydric soils), the U.S. Department of the Interior Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps (USFWS 2009) that indicate known USFWS wetlands, and the U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps that depict features (including natural and cultural) of a mapped area. Other information sources were used to evaluate potential locations of waters of the U.S., which are shown on Figure 5 and include the following:

- The USFWS 1970 wetlands map which catalogues known wetlands and open water surfaces from aerial surveys. Many open water bodies (such as those on the 'Ewa Plain near the rapid transit route) were previous irrigation impoundments that have long since been removed.
- The Geographic Approach to Planning (GAP) maps (Erickson, 2006)—which only cover bird habitats in the Pearl Harbor area.
- The Hawai'i Wetlands Joint Venture (HWJV 2006)—which provides a point location (not an area) as a wetland identifier.

The final source used in the desktop review to identify potential sites was the examination of a 250-foot-wide (either side of centerline) buffer along the right-of-way of the Project using satellite imagery and aerial photographs. These methods revealed additional sites appropriate for more detailed field investigations.

The field surveys, of the sites selected, determined if an area warranted investigation as to the presence/absence of waters of the U.S. The on-site field surveys involved the inspection of the Project corridor for the presence/absence of waters of the U.S. This included investigating all of the 22 named streams crossed by the Project and/or any other area mapped on the reviewed resources that indicated the potential presence of waters of the U.S. within and/or adjacent to the Project. During the on-site field surveys, it was discovered that some sites identified in the desktop review did not support any waters of the U.S. However, the existing conditions of the identified sites was documented and recorded in the routine wetland determination data form. One site, Waiawa Springs, was added when it was discovered as part of the survey of the Waiawa Stream and deemed to be substantial enough to merit its own site designation.

The desktop review and the on-site field surveys resulted in the identification of 31 sites, which are discussed in this report and are identified as Sites 1 through 31. It should be noted that Sites 23, 24, and 26 are within the Salt Lake alignment, which is not the selected alignment. However, at the time of the initial work for this study, it was not yet determined that the Preferred Alternative was the Airport alignment and Salt Lake alignment would not be considered as part of this Project. The sites along the Salt Lake alignment are therefore, included in this study. Due to the types of waters of the U.S. and the potential impacts that may occur, the sites have been sorted into five different categories (Categories I–V). Section 5.0, Site Descriptions and Potential Impacts, describes the five categories and the methodology used to determine the appropriate category for each site and the potential impacts that may occur at a particular site.

4.2 Identification of the Ordinary High Water Mark (OHWM)

The ordinary high water mark (OHWM) is defined in 33 CFR 328.3(e) as: “that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider characteristics of the surrounding areas.” In non-tidally influenced streams, the OHWM is the jurisdictional line per Section 404 of the CWA and Section 10 of the RHA. The jurisdictional line for tidally influenced waters of the U.S. is defined as the high tide line per Section 404 and the mean high water per Section 10.

OHWM for Non-tidal Waters of the U.S.

The OHWM of non-tidal waters of the U.S. was identified by the review of available USGS stream gage data and in the field by the observation of various indicators that included observation of multiple flow events; natural line impressed on the bank; shelving, scouring; bed and banks; water staining; wracking; deposition of sediment; changes in soil character; sediment sorting; presence of litter and debris; changes in plant communities; matted, bent, or absent vegetation; and destruction of vegetation. Upon identification of the OHWM, field investigators marked or flagged one or two base locations that were surveyed by Control Point, Inc. and then used to extend the OHWM line for incorporation into the Project design plans. The individual site descriptions (Appendix A, Detailed Site Descriptions and Potential Impacts) provide additional details on how the OHWM was determined for each of the non-tidally influenced waters of the U.S.

OHWM for Tidally Influenced Waters of the U.S.

The OHWM of tidally influenced waters of the U.S. may be determined by tidal elevations. The National Oceanographic and Atmospheric Administration (NOAA) collects tide data through gage stations and maintains the recorded information in a database. NOAA operates the Honolulu Harbor tide gage station (Station #1612340). The tidal parameters calculated from the data recorded at this station

between 1983 and 2001 (nearly 19 years) provide the following elevations when adjusted to a datum (base elevation) of mean sea level (MSL) = 0.00 feet:

- Mean higher high water MHHW: 1.08
- Mean high water MHW: 0.62
- Mean sea level MSL: 0.00
- Mean Low Water MLW: - 0.66
- Mean lower low water MLLW: - 0.82

For purposes of our calculations of OHWM in tidal reaches of streams entering Pearl Harbor, Ke'ehi Lagoon, and Honolulu Harbor the MHHW value of 1.08 feet was used as the default OHWM. It should be noted that extreme high tides may exceed this elevation by 0.88 feet or more during some Spring tides.

The tidal elevation of waters of the U.S. was first estimated by the examination of stain lines on concrete structures adjacent to the waters taking into account whether other indicators were also present. This elevation was established in the field by reference to a fixed point that allowed the surveyors to later establish the elevation of the estimated OHWM. In those few cases where the estimated elevation was lower than 1.08 feet above MSL, the OHWM was taken as 1.08 feet. The individual site descriptions (Appendix A) provide additional detail on the specific criteria used to estimate the OHWM at each survey site. Upon identification of the OHWM, field investigators marked or flagged one or two base locations that were surveyed by Control Point, Inc. and then used to extend the OHWM line for incorporation into the Project design plans.

4.3 Wetlands

Wetlands are defined as those areas that are “inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” [33 CFR 328.3(b)].

Wetlands within and/or adjacent to the Project right-of-way were identified in accordance with the USACE *Wetlands Delineation Manual* (USACE 1987). In addition, the USFWS *National List of Plant Species that Occur in Wetlands* (Reed 1988) was consulted to classify wetland plant species identified at the investigated locations. The *Hawai'i Wetland Field Guide* (Erickson 2006) was used in support of the USFWS publication; however, the USFWS publication was used to make the final wetland plant classification documented in the routine wetland determination data form. The USACE *Wetlands Delineation Manual* (USACE 1987) defines wetland areas jurisdictional if they meet all three of the following criteria:

- Hydrophytic vegetation
- Hydric soils
- Wetland hydrology

Since the issuance of the USACE *Wetlands Delineation Manual* (USACE 1987), Supreme Court decisions have refined the requirements for certain wetlands to be

considered jurisdictional. Specifically, the 2001 Supreme Court decision of the *Solid Waste Agency of Northern Cook County (SWANCC) v. USACE* concluded that a wetland is required to be hydrologically connected to a jurisdictional water of the U.S. Further guidance has been issued subsequent to the 2006 Supreme Court decision in *Rapanos v. United States*, which concluded that the USACE and the U.S. Environmental Protection Agency (EPA) will assert jurisdiction over:

- Traditionally navigable waters (TNW) and wetlands adjacent to TNWs
- Waters that are not TNWs provided they are relatively permanent waters (i.e., flows year-round, or at least “seasonally,” and includes wetlands adjacent to such water bodies if the wetlands “directly abut,” and includes wetlands adjacent to such water body)
- Waters that are neither TNWs nor relatively permanent waters provided that a “significant nexus” exists between the water (including adjacent wetlands) and a TNW

Upon field identification of potential wetland at survey sites, the routine on-site investigation approach of the USACE *Wetlands Delineation Manual* (USACE 1987) was utilized to determine if the area met the wetland criteria. This methodology consisted of establishing wetland determination plots which documented the vegetation, soils, and hydrology at each plot location. In addition, the *Jurisdictional Determination Form Instructional Guidebook* (USACE 2007) was consulted to assist the field investigators in the preliminary jurisdictional evaluation of the identified wetland sites. As needed, to determine potential impact or no impact, the wetland boundaries were then marked/flagged for a distance of at least 250 feet from the centerline of the Project, or until the wetland boundary terminated, whichever occurred first. The marked/flagged locations were then surveyed by Control Point, Inc., for incorporation into the appropriated design plans.

The mangrove wetlands that occur along several of the modified channels crossed by the Project were identified with a method set by the USACE (1999; WCP & AECOS, 2007) to delineate mangrove wetlands adjacent to stream channels. This method included using the available aerial photography and conducting an on-site field survey at the identified locations. During the on-site field survey, the existing conditions of the mangal (mangrove forest) was documented and the boundary of the mangal was visually transposed onto the preliminary engineering plan sheets for inclusion in this report. Soil information was not collected at these locations due the obvious challenges to collecting soil information in the mangal. Mangal wetlands are tidal wetlands dominated by an obligate wetland plant, and are therefore jurisdictional.

The site descriptions (Appendix A) provide a discussion of the identified wetlands and include the prepared routine wetland determination data forms for each wetland. The identified wetlands within and/or adjacent to the Project can be classified by one or more of the following classifications as per Cowardin (1979):

Palustrine

Non-tidal and tidal-freshwater wetlands in which vegetation is predominately trees (forested wetlands); shrubs (scrub-shrub wetlands); persistent or non-persistent emergent, erect, rooted herbaceous plants (persistent- and non-persistent-emergent wetlands); or submersed and (or) floating plants (aquatic beds). Also, intermittently to permanently flooded open-water bodies of less than 20 acres in which water is less than 6.6 feet deep.

Lacustrine

Non-tidal and tidal-freshwater wetlands within an intermittently to permanently flooded lake or reservoir larger than 20 acres and (or) deeper than 6.6 feet. Vegetation, when present, is predominately non-persistent emergent plants (non-persistent-emergent wetlands), or submersed and (or) floating plants (aquatic beds), or both.

Riverine

Non-tidal and tidal-freshwater wetlands within a channel. Vegetation, when present, is the same as the Lacustrine System. The Riverine System is often used to classify streams/non-wetland waters of the U.S. However, in this report, streams/non-wetland waters of the U.S. are classified as perennial, intermittent, or ephemeral.

Estuarine

Tidal wetlands in low-wave-energy environments where the salinity of the water is greater than 0.5 part per thousand (ppt) and is variable owing to evaporation and the mixing of seawater and freshwater.

Marine

Tidal wetlands that are exposed to waves and currents of the open ocean and to water having salinity greater than 30 ppt.

4.4 Streams/Non-wetland Waters of the U.S.

Streams/non-wetland waters of the U.S. are typically identified by an observable “bed and bank.” In general, streams maintain various water flow frequencies that are characterized as ephemeral, intermittent, or perennial. An ephemeral stream flows only in response to rainfall events, while an intermittent stream flows for parts of the year often in response to fluctuating groundwater levels and rainfall events. An ephemeral stream is usually not marked on a USGS topographic quadrangle map; however, an intermittent stream is usually marked by a line of blue dashes and dots. A perennial stream typically flows year-round and is marked on a USGS topographic quadrangle map by a solid blue line.

During the field surveys, streams/non-wetland waters of the U.S. were encountered within and/or adjacent to the right-of-way of the Project. The OHWM, if present, was identified in the field by using the methods described in Section 4.2. The *Jurisdictional Determination Form Instructional Guidebook* (USACE 2007) was also consulted to assist the field investigators in the preliminary jurisdictional evaluation of the identified stream sites. A detailed discussion of the identified streams/non-wetland waters is provided in Appendix A and preliminary plans and profiles of each the waters along the Project are provided in Appendix B.



Figure 5. Compilation of Published Wetland Maps



Figure 6. Study Sites Key Map

5.0 Categories of Project Effects on Waters of the U.S.

A total of 31 different locations (Sites 1-31; although Site 11 consists of two locations 11A and 11B) were studied. Upon completion of the data gathering and assessment process, these locations were sorted into five different categories based on the characteristics of the waters of the U.S. and potential impact of the Project on aquatic and ecological resources. The categories generally range from lowest potential impact to greatest potential impact, with Category I representing an absence of waters of the U.S. and, therefore, no possible impact to waters of the U.S.; Categories II through III representing waters of the U.S. with no structural elements proposed below OHWM of these waters; Category IV representing wetlands proximate to the Project with no structural elements proposed within the wetland limit; and Category V with waters present and structural elements potentially encroaching on those waters. Categories II through IV represent types of water resources with increasing potential for impacts due to sensitivity of the aquatic environment at the site (e.g., wetlands are regarded as more sensitive environments than concrete-lined culverts).

A conservative approach was used to categorize the sites to assume the worst case. In some cases, more than one type of aquatic feature is present (for example, a proximate wetland and a concrete-lined channel occur together) and the site is placed in the higher of the two category types.

Description of the categories and site numbers within each category is provided below. Appendix A provides more detailed information about the sites.

5.1 Category I—Sites Studied that Are Not Waters of the U.S.

The vast majority of the Project is located on uplands with no aquatic resources and no potential to be waters of the U.S. as defined under Section 404 of the CWA (USC 1972) and/or Section 10 of the RHA (USC 1899). Taking a due-diligence approach to surveying the Project corridor, a number of sites were investigated that, upon visual inspection, demonstrated no surface hydrology. In as much as this study presents all of the information gathered, both in the field and through information sources as described in Section 4.0, these Category I sites have not been deleted from the report. All of the remaining categories (Categories II through V) have sufficient evidence of surface hydrology to warrant additional consideration to establish a preliminary OHWM and/or a wetland delineation.

Sites determined to be listed in Category I are study sites 3, 5, 8, 11A, and 21.

5.2 Category II—Concrete-lined Channel Waters of the U.S. Spanned by the Project.

Category II sites are all concrete-lined channels or culverts that function as flood control. These are engineered structures that have replaced intermittent or perennial streams crossed by the project corridor. In all cases, an OHWM survey was undertaken and which coincides (not unexpectedly) with an elevation on the walls of

the culvert. These structures were all designed to contain flows in excess of the OHWM flows of their respective drainages. In the case of vertical side walls, the OHWM and the wall itself coincide in plan view. Further, for the sites included in this category, the channel structure is spanned by the Project and not impacted in any other way. Some degree of shading of the channel is the most likely impact from the Project.

Sites determined to fall into Category II are 6, 7, 10, 14, 19, and 23.

5.3 Category III—Modified and Unmodified Channel Waters of the U.S. Spanned by the Project

Category III sites are modified and unmodified channels that function in flood control. Typically, these are channels of intermittent or perennial streams that have been realigned and retain some semblance of a natural bed and banks. The primary function of these channels is to transport flood waters. In most cases, the banks are fill material (or the channel itself has been trenched and graded) but can support vegetation. Maintenance activities may include opening of the channel by dredging and/or removal of vegetation. These are engineered features crossed by the project corridor. One exception is Site 31, which is an unmodified channel of an intermittent tributary stream.

An OHWM survey was undertaken in each case. However, because of the nature of the bank, this line will not necessarily be smooth and at a constant height along the bank. That is, with increasing distance from the OHWM survey points, the uncertainty of the OHWM as shown on engineering drawings will increase. As with the Category II culverts, these channels were designed to contain flows greatly in excess of the OHWM flows of their respective drainages. However, some are tidal estuaries that rely on expanded cross-sectional area and proximity to the mouth to accommodate high flows rather than an elevated bank. For all the sites included in this category, the channel is spanned by the Project and not impacted in any other way. Some degree of shading of the channel is the most likely impact from the Project.

Study locations placed into Category III are sites 4, 9, 18, 28, and 31.

5.4 Category IV—Wetlands Proximate to the Project.

At five of the study sites, wetlands are present in the vicinity (within the 500-foot-wide (250 feet on either side of centerline) survey corridor centered along the Project). In no instance are structural elements of the Project planned to be built in these wetlands. In most cases, the Project spans a Category II or III stream, but the proximity of a wetland places these sites in Category IV based upon consideration of the greater sensitivity to indirect impacts of the aquatic features and the different treatment afforded wetlands under Section 404 of the CWA (USC 1972). The sites in this category were divided into two categories: Category IV-A, representing freshwater wetlands, and Category IV-B, representing littoral (tidal) or mangrove

wetlands. Whether a freshwater or a littoral, brackish wetland occurs is largely a function of the proximity of the Project to the coastline.

Category IV-A—Freshwater wetlands proximate to the Project

The two freshwater wetlands are fed by freshwater springs and drain as freshwater streams passing under the Project's elevated guideway. These wetlands are agricultural pond fields (for example, the Sumida watercress farm adjacent to Pearlridge Center). The potential for shading of the channel or wetland or both is the most likely impact from the Project. Construction-related impacts must be addressed by avoidance and implementation of appropriate best management practices.

The Category IV-A sites are 15, 17 and 25.

Category IV-B—Mangrove wetlands proximate to the Project

The American or red mangrove (*Rhizophora mangle*) is an obligate wetland species that grows in the intertidal and upper subtidal of quiet brackish-to-marine waters as found in enclosed bays and estuaries. There are many species of mangrove plants in tropical waters, but none is native to the Hawaiian Islands, where the red mangrove in particular is regarded as an invasive species. Pearl Harbor supports the most extensive examples of mangal on O'ahu, but many of these have been cleared in recent years. Clearing of an established mangal typically results in an intertidal (littoral) mudflat that is soon populated by rooted seedlings if tree clearing is not followed by regular maintenance removal of the abundant seedlings that float in from nearby uncleared mangroves.

The Category IV-B sites are typically the estuarine segment of modified channels that are fringed by mangroves. 'Aiea Bay Recreation Area (Site 20) was an extensive mangal along the shore of East Loch of Pearl Harbor, but the trees were all removed in 2007 (WCP & AECOS, 2007). These intertidal wetlands are located near the Project; other features (estuarine channels) at these same sites are spanned by the Project. Some degree of shading of the channel or wetland or both is the likely impact from the Project.

Included in Category IV-B are sites 11B, 16, 20, 22, and 26.

5.5 Category V—Structural Elements of the Project in Waters of the U.S.

Category V sites are either tidal waters or streams where the present design of the Project indicates an actual or potential (that is, outside, but reasonably within the level of uncertainty of the OHWM determination) encroachment on waters of the U.S. These are all of the locations along the proposed corridor where a direct impact on waters of the U.S. is possible. Several types of waters are represented: modified channels of streams or their estuaries, tidal waters, and natural streams (intermittent or perennial). Each is either a traditional navigable waterway (TNW) or a relatively permanent water (RPW). Direct impacts are limited, in most cases, to placement of one or more concrete support columns in waters of the U.S. Temporary impacts may

occur where structures are required to be built in waters of the U.S. to facilitate construction of the permanent structural elements (including spans).

Listed under Category V are sites 1, 2, 12, 13, 24, 27, 29, and 30

5.6 Potential Impacts

The potential impacts to waters of the U.S. that may occur as a result of the Project were determined by the review of the preliminary design plans and the currently proposed activity at each site and are summarized in Table 1. An impact reported as a fill are locations where a pier column may be placed below/within the OHWM of a stream channel and/or wetland boundary. Impacts reported as a shade/clearing impact are locations where the Project will likely span a stream channel and/or wetland boundary and may result in the shading of a stream channel and/or removal of adjacent vegetation. Impacts below/within the OHWM and/or wetland boundary are not anticipated at the shade/clearing locations. The exact impact type/amount, as well as, other permanent and/or temporary impacts (i.e., temporary placement of coffer dams within a stream channel, stream bank contouring, placement of rip rap along stream bank), can not be determined at this phase of the Project. However, avoidance and minimization measures are being evaluated in the design phase of the Project, and will be included in the Final EIS and the Section 404/10 permit application. For instance, if a pier column has been placed in a stream channel during the preliminary design phase, the pier column, if possible, will be relocated outside of the stream channel.

Potential impacts to Waters of the U.S, will be discussed in the Final EIS and as part of the Section 404/10 permit process. It is the purpose of this document to preliminarily identify jurisdictional waters, provide documentation of that process, and associate Project elements in relation to these jurisdictional waters.

6.0 Acronyms and Abbreviations

cfs	cubic feet per second
CWA	Clear Water Act of 1972
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
HDOT	State of Hawai'i Department of Transportation
MHHW	mean higher high water
MHW	mean high water
MLLW	mean lower low water
MLW	mean low water
MSL	mean sea level
NRCS	National Resources Conservation Service
NWI	National Wetland Inventory
OHWM	ordinary high water mark
ppt	parts per thousand
RHW	Rivers and Harbors Act of 1899
RPW	relatively permanent water
TMDL	total maximum daily load
TNW	Traditional Navigable Waters
U.S.	United States
USACE	United States Army Corps of Engineers
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	United States Geological Survey

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Appendix A
Detailed Site Descriptions and Potential Impacts

Appendix B

Stream Crossing Drawings

Wetland and Waters of the U.S. Study Honolulu High-Capacity Transit Corridor Project

Appendix A—Detailed Site Descriptions and Potential Impacts

July 10, 2009

Prepared for:
City and County of Honolulu

Appendix A—Detailed Site Descriptions and Potential Impacts

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Category I—Sites Studied that Are Not Waters of the U.S.

Site 3—Honouliuli-Aloun Farms

Site Summary

Site 3—Honouliuli-Aloun Farms (approximate elevation 125 feet) consists of farm lands at the top of an un-named side gulch system draining to former wetlands (now a golf course) along Honouliuli Stream. The site is south of the Farrington Highway 94-1400 block and east of junction with a plantation road (see the following Site 3 maps).

During the field surveys, no wetland conditions and/or other waters of the U.S were observed at Site 3. The existing conditions of Site 3 were documented and recorded in the routine wetland determination data form (see the following Site 3 form). Background research suggested that Site 3 warranted on-site field surveys; however, the site investigation revealed that previous and current land-uses have significantly altered the area. The approximate location of Site 3 is 21°22'18.504"N latitude and 158°2'21.762"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 12,640-acre Honouliuli watershed is adjacent to the Waikele watershed but only receives runoff from the east face of the Wai'anae Mountain Range. Because this portion of the range is in the tradewind rain shadow of the Ko'olau Mountain Range, these slopes and the stream are typically dry. The lower reach of the stream receives ground water inflow from springs and the stream is perennial. A majority of the watershed is either farm land or preservation land, with minor urban and golf course land uses along the lower reach. The gulch investigated at this site would drain to Honouliuli Stream through West Loch Golf Course.

The site was visited on 3-20-09 at mid-morning under clear skies with photos taken as shown in the following photographs. The site was investigated because of the proximity of the upper ends of a gulch system draining towards Honouliuli Stream. The site was investigated to rule out the presence of springs or seeps, which could support wetlands. The alignment of the proposed right-of-way passes through actively used agriculture lands about 350 feet upslope of the edge of the gulch.

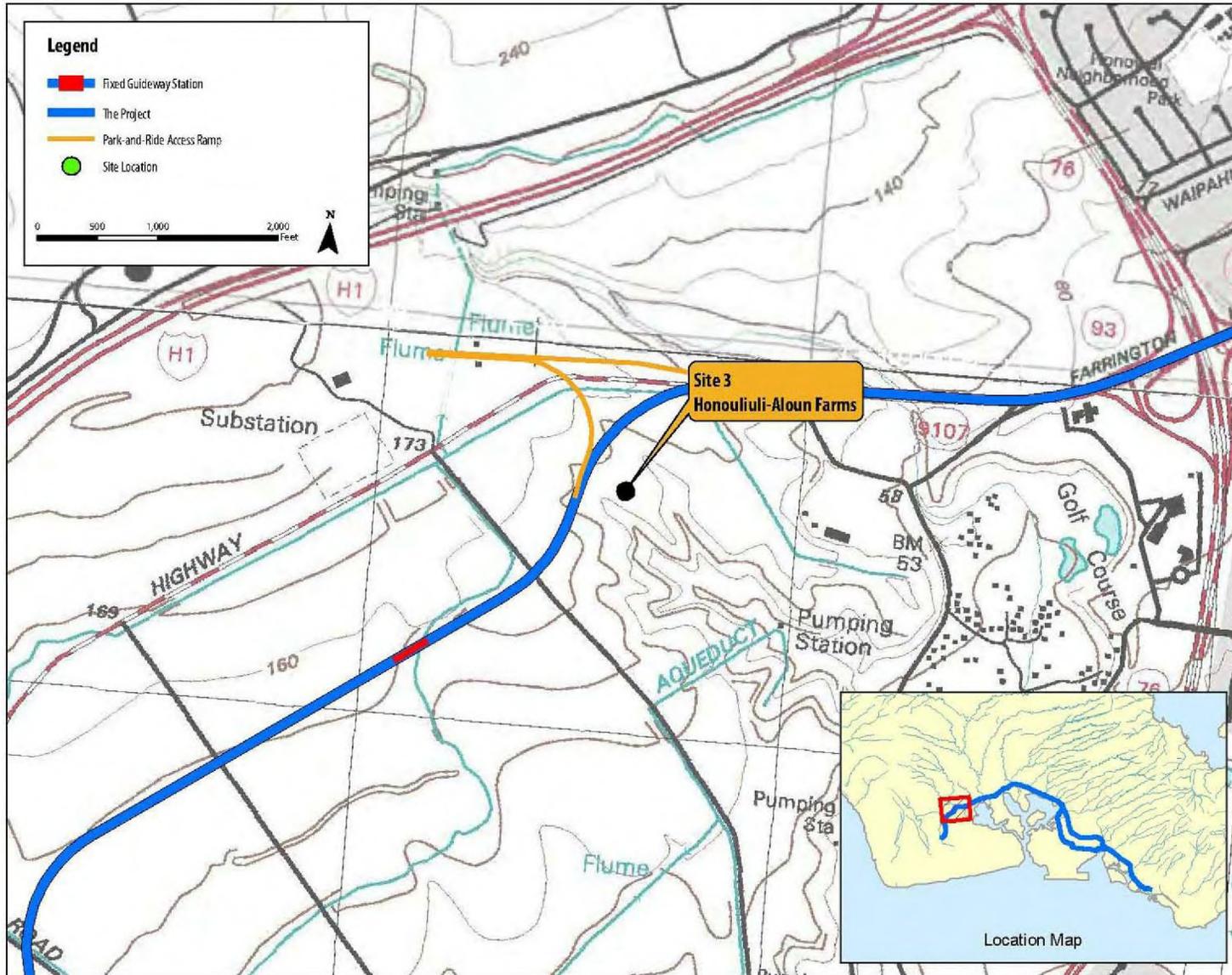
The property was accessed over agriculture service roads. The unfarmed area proved to be a dry erosional gulch with no wetland plants or hydric soils present. One site photo looks upslope through a swale between farmed lands and across the proposed right-of-way (Photo 3A). The previous week there had been a significant rainfall in the watershed resulting in a peak flow of 9 cfs through the nearby Honouliuli Stream. Evidence of sheet flow was noted at this site from the agriculture fields into the gulch (Photo 3B). Erosional

features within the gulch proved to be 2- to 5-foot-deep grass-covered gullies (Photo 3C and Photo 3D).

Potential Impacts

Construction activity will occur in the vicinity of Site 3 (see Appendix B, Preliminary Alignment Plans and Profiles Wetland and Waters of U.S. Study Sites 1–31, July 2009); however, on-site field investigations revealed that no waters of the U.S. occur at Site 3. Therefore, no waters of the U.S. would be impacted at Site 3.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 3A: View up slope from top of gulch to right-of-way alignment through agriculture fields



Photo 3B: Evidence of surface runoff to swale behind



Photo 3C: View of swale overgrown with non-wetland plants



Photo 3D: View of swale overgrown with non-wetland plants



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 3. Honouliuli-Aloun Farms</u>	Date: <u>3/20/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): _____

Remarks: No vegetation; only bare soil, upland vegetation and agricultural crops present.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	<i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
--	---	---

Field Observations:
 Depth of Surface Water: _____ (In.)
 Depth to Free Water in Pit: _____ (In.)
 Depth to Saturated Soil: _____ (In.)

Remarks: The site was investigated because of the aerial photo presence of unfarmed land with the appearance of gully erosion. Some evidence present of water movement across bare soil areas. The area is sloped, well drained, active farmlands. Drift lines and sediment erosion determined to be result of runoff (either storms or irrigation).

SOILS

Map Unit Name (Series and Phase): <u>Waipahu Silty Clays (WzA, WzB)</u>	Drainage Class: <u>Well Drained</u>	<i>Circle</i>
Taxonomy (Subgroup): <u>Torrertic Haplustolls</u>	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)

Remarks: Not tested. The site consisted of active and fallow agriculture lands (tilled soils).

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	

Remarks: Form used to document non-wetland waters' characteristics at this location.

Form Content Approved by HQUSACE 3/92

Site 5—Upper West Loch Golf Course

Site Summary

Site 5—Upper West Loch Golf Course (approximate elevation of adjacent right-of way 80 feet) is an approximately 1-acre lot located along the south side of Farrington Highway at the junction of Old Fort Weaver Road. Honouliuli Stream, the nearest aquatic feature, is over 500 feet south of the project right-of-way (see the following Site 5 maps).

During the field surveys, no wetlands or other waters of the U.S. were present at this location. The existing conditions of Site 5 were documented and recorded in the routine wetland determination data form (see the following Site 5 form). Background research suggested that Site 5 warranted an on-site field survey; however, the site investigation revealed no waters of the U.S. are at this location. The approximate location of Site 5 is 21°22'28.120"N latitude and 158°1'48.376"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 12,640-acre Honouliuli watershed is adjacent to the Waialeale watershed but only receives runoff from the east face of the Wai'anae Mountain Range. Because this portion of the range is in the tradewind rain shadow of the Ko'olau Mountain Range, these slopes are typically dry. The lower reach of the stream receives ground water inflow from springs and the stream is perennial. A majority of the watershed is either farm land or preservation land, with minor urban and golf course land uses along the lower reach. The gulch investigated at this site would drain to Honouliuli Stream through West Loch Golf Course.

Site 5 is a triangular lot about 1 acre in area. This site was selected for examination based upon its proximity to Honouliuli Stream and soils mapped as Pearl Harbor clay (Foote 1972), a potentially hydric soil. The lot is unused and overgrown, adjacent to the West Loch Golf Course and the St. Francis Medical Center-West.

The site was visited on 3-20-09 and 7-5-09. Observation of the site, as documented with the following photograph, showed the site to be characterized by upland plants, dry sandy soils, and sloped topography not suitable for holding water. The land neither contains nor is adjacent to any water source or supports any vegetation characteristic of wetlands. In the event of heavy rains, it is likely that water would sheet flow off the property to the adjacent golf course.

Potential Impacts

Construction activity will occur in the vicinity of Site 5 (see Appendix B); however, on-site field investigations revealed that no waters of the U.S. occur at Site 5. Therefore, no waters of the U.S. would be impacted at Site 5.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 5A: Overview of 1-acre lot showing dry land foliage—background view of West Loch Golf Course and St. Francis Medical Center



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 5. Upper West Loch Golf Course</u>	Date: <u>7/5/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>E. Guinther</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 1</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u>Cenchrus ciliaris</u>	HERB	NL	8		
2 <u>Panicum maximum</u>	HERB	FACU	9		
3 <u>Leucaena leucocephala</u>	SHRUB	UPL	10		
4 <u>Desmanthus virgatus</u>	SHRUB	FACU	11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: Although C. ciliaris is not listed (Reed, 1988), it is the most common grass on uplands of dry, leeward Oahu.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: <u>0</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Remarks: _____

SOILS

Map Unit Name (Series and Phase): <u>Waipahu Silty Clay (WZA)</u>	Drainage Class: <u>Well drained</u> <i>Circle</i>				
Taxonomy (Subgroup): <u>Torrertic Haplustolls</u>	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0 - 0.5	O				turf, plant matter little broken down; roots
0.5 - 12	A	5YR 2.5/2	none		Loam to silt loam
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>Soil pit at southern edge of parcel outside fence. 21.374033 N Latitude, 158.030323 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Remarks: _____			

Form Content Approved by HQUSACE 3/92

Site 8—Kalapawai Junction with Waikele

Site Summary

Site 8—Kalapawai Junction with Waikele (approximate elevation 140 feet) is a vacant lot located adjacent to Farrington Highway and to the left bank of Waikele Stream. Site 8 is located to the south of the Project where the project corridor primarily follows the existing Farrington Highway alignment (see the following Site 8 maps). The background research and the proximity of other waters of the U.S. indicated that an on-site field survey was warranted at this location.

During the field surveys, no wetland and/or non-wetland waters of the U.S. were observed at this location. The plant species observed were all upland species, and no surface hydrology or saturated conditions were observed. A soil pit was not taken due to the dominant upland plant species and no indications of hydrology. The existing conditions of Site 8 were documented and recorded in the routine wetland determination data form (see the following Site 8 form). The approximate location of Site 8 is 21°22'57.300"N latitude and 158°0'36.000"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

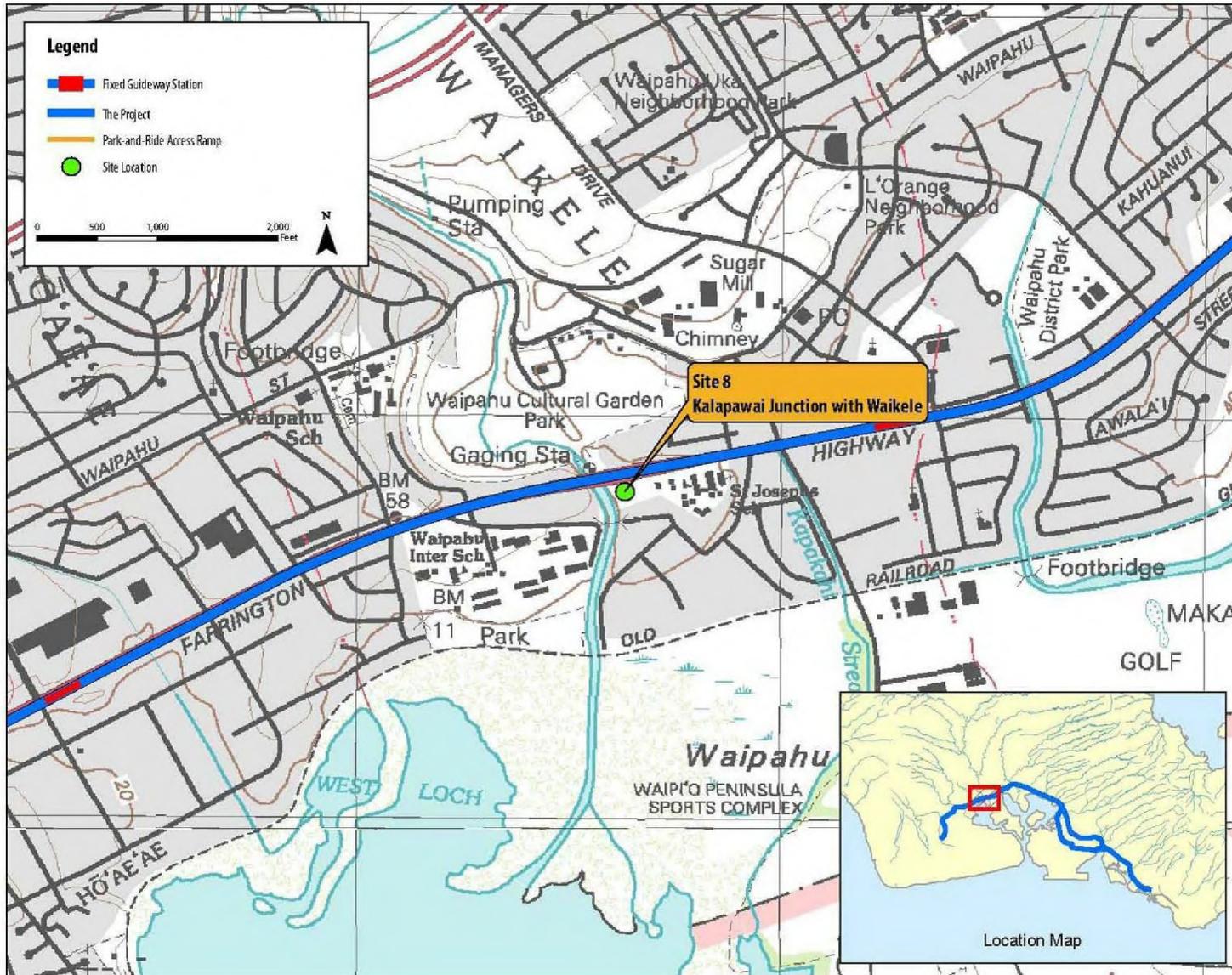
The 30,985-acre Waikele watershed is the largest watershed on O'ahu draining the Schofield plateau between the Ko'olau and Wai'anae Mountain Ranges. Waikele is a second-order stream with a length of about 10 miles, receiving tributary flows from Kīpapa and Waikakalaua Streams, draining the Ko'olau Mountain Range. Waikele Stream is intermittent in its upper reaches, draining the Wai'anae Mountain Range (a perennial stream [interrupted] in its middle reach).

Site 8 was visited on 3-26-09 at 8:30 a.m. under conditions of clear skies and no recent rainfall as documented in the following photograph. The site was revisited on 7-05-09. On the left bank of Waikele Stream, facing south from Farrington Highway, is a large vacant and highly vegetated lot (Site 8) where soil maps indicate a soil type associated with wetlands. However, Site 8 was determined not to be a wetland due to the observation of upland plant species being the dominant vegetation and no indicators of saturation or surface hydrology. In addition, the site is at least 30 feet above the Waikele Stream and separated by a concrete retaining wall.

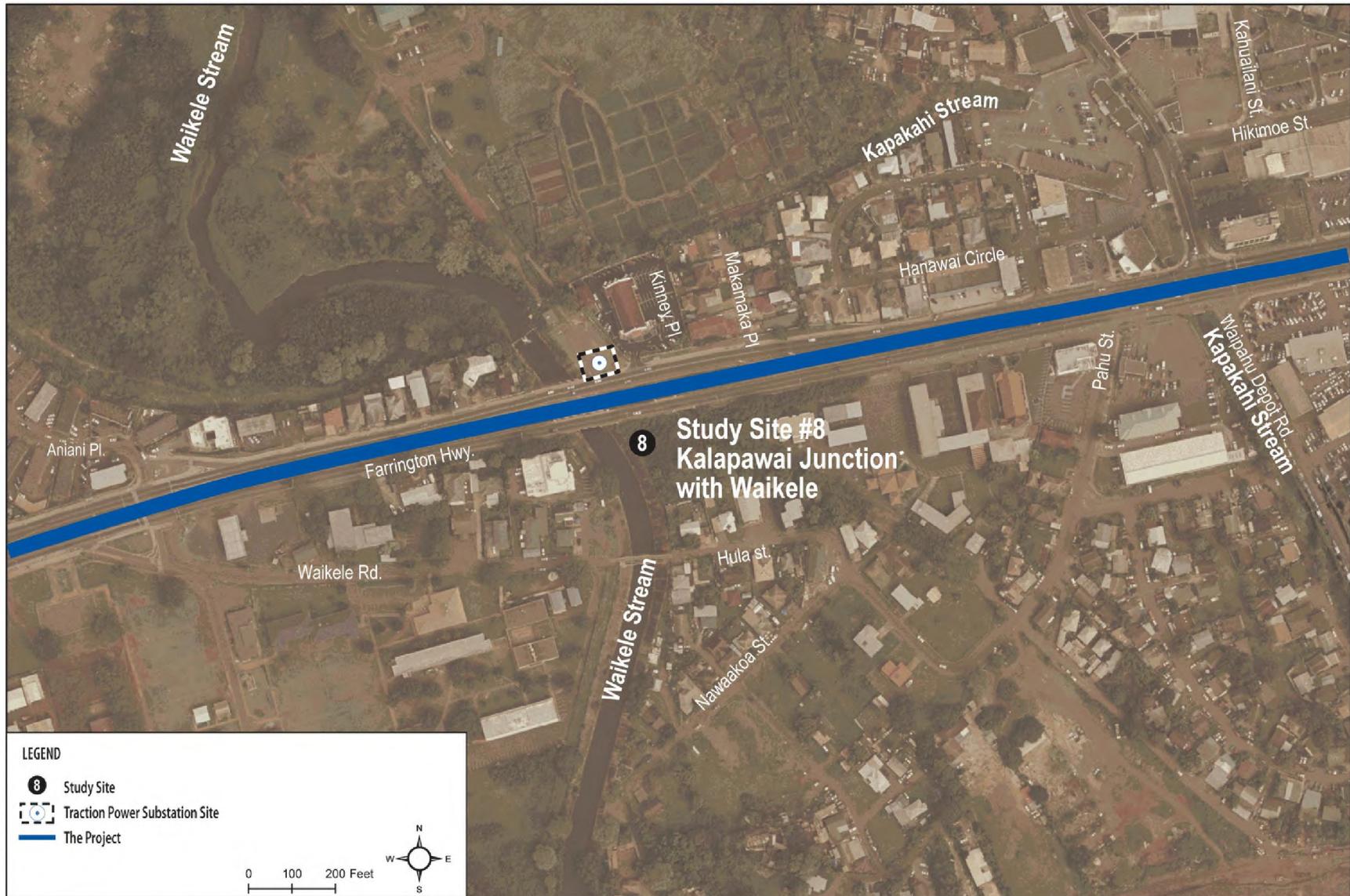
Potential Impacts

Construction activity will occur in the vicinity of Site 8 (see Appendix B); however, on-site field investigations revealed that no waters of the U.S. occur at Site 8. Therefore, no waters of the U.S. would be impacted at Site 8.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 8A: The lot adjacent to the Waikēle Stream is listed as having potentially hydric soils. The dry character and high elevation of the land above the stream, combined with the absence of wetland vegetation, rule out this property as a wetland.



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 8. Kalapawai Junction with Waikele</u>	Date: <u>7/5/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>E. Guinther</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Panicum maximum	HERB	FACU	8		
2 Cenchrus ciliaris	HERB	NL	9		
3 Leucaena leucocephala	TREE	UPL	10		
4 Leonolis nepetifolia	HERB	NI	11		
5 Prosopis pallida	TREE	FACU-	12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: Although C. ciliaris is not listed (Reed, 1988), it is the most common grass on uplands of dry, leeward Oahu.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: _____ (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>Parcel is 30-ft above a concrete bank of Waikele Stream; no hydrology possible from Waikele stream or any place further inland.</u>	

SOILS

Map Unit Name (Series and Phase): <u>Waipahu Silty Clay (WzB)</u>	Drainage Class: <u>Well Drained</u> Circle				
Taxonomy (Subgroup): <u>Torrertic Haplustolls</u>	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>No soil sample was examined. Site is upland.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: _____			

Form Content Approved by HQUSACE 3/92

Site 11A—Maintenance and Storage Facility near Leeward Community College (maintenance facility)

Site Summary

Site 11 consists of two locations: Site 11A—Maintenance and Storage Facility (maintenance facility) and Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor). Site 11A and Site 11B are located south of the Farrington Highway/H-1 Freeway Interchange and west of Leeward Community College at 21°23'31.472"N latitude and 157°59'16.770"W longitude and 21°23'17.896"N latitude and 157°59'16.079"W longitude, respectively (see the following Site 11 maps).

Site 11A—Maintenance and Storage Facility (maintenance facility)

Site 11A is a former navy drum storage site that is currently undeveloped. This location was investigated due to the proposed activity at such a large undeveloped area. During the on-site field surveys, no wetlands and/or non-wetland waters of the U.S. were observed. The site is a dry upland area with exposed soils and/or covered with upland plant species. The existing conditions were documented and recorded in the routine wetland data form (see the following Site 11 form). The approximate elevation of Site 11A is 90 feet.

Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor)

A stormwater outfall is proposed in the vicinity of this location; therefore, an on-site field survey of the proposed outfall area was conducted to document the existing conditions and, if present, delineate any waters of the U.S. During the on-site field surveys, a littoral wetland was observed and the boundary was delineated for incorporation into the design plans. The wetland delineation included three transects that were conducted perpendicular to the shoreline approximately 40 feet east, center, and west of the proposed stormwater outfall. Each transect consisted of two pits, one upslope and one downslope of the tidal wrack line. The routine wetland determination data forms provide additional detail on the delineation methods. This wetland is within the intertidal zone of a TNW, Middle Loch. The approximate elevation of Site 11B is 0 feet. (Site 11B USGS Topographic Map, Aerial Site Map, Site Photographs, and Routine Wetland Delineation Forms are found under Category IV-B of this Study).

Site Description

The Waipi'o Peninsula divides Middle Loch and West Loch of Pearl Harbor. The property is actually at the head of Middle Loch with no significant surface drainage across the site, no defined link to upslope drainage areas, and no defined springs to the harbor at the shoreline. The site was first visited on 2-26-09 at 9:30 a.m. under clear no-rainfall conditions as documented in the following photographs.

Site 11A—Maintenance and Storage Facility (maintenance facility)

The site was revisited on 7-6-09. Site 11A is a former navy drum storage area that is approximately 20 acres in size. This area extends from Farrington Highway at an elevation of 80 to 90 feet approximately 1,000 feet down slope to a fenced border several hundred feet from the harbor and at an elevation of 30 to 40 feet. This area is an interfluvial hill, having a higher elevation than the community college to the east and the high school athletic field to the west. The area had been cleared at the time of the survey with large sections of graded bare earth. The remaining vegetated portions were typical of dry upland on leeward O'ahu, dominated by Guinea grass and koa-haole scrub, with a few kiawe trees present. There does not appear to be any source of drainage to the property from above and no drainage features on the land surface. Runoff appears to sheet flow to the south, east, and west, with no significant ponding on site. Below the fenced border, the property elevation drops quickly through dense koa-haole scrub to a former cane road paralleling the shoreline.

Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor)

The site was revisited on 6-19-09 and on 7-6-09. The shoreline is low sloping, consistent with typical offshore winds and a lack of significant wave energy within the harbor. However, at the proposed drainage outlet location, land behind the shore has been built up with soil and boulder fill. Here, the backshore drops some 3 feet as an eroding bank that the higher tides lap against. The high tide is marked by deposits of flotsam. Guinea grass, koa-haole, milo, and castor bean dominate the dry strand; juvenile mangroves and pickleweed appear in the intertidal areas immediately off the high tide shoreline. Part of the intertidal here was a dense mangrove thicket, removed in 2007, but now gradually reestablishing.

Several spring-fed wetlands occur along this northern coastline of Middle Loch and north of the Pearl City Peninsula (WCP 2007). In fact, a mitigation wetland (Kolea Cove wetland, DA Permit 1594-S; ACOE, 1999) is located some 200 feet west of the proposed drainline from the project maintenance and storage facility. The route selected for the drainline follows a piece of elevated land presently supporting a dirt road connecting between the cane road and the upland Navy parcel, avoiding all spring-fed wetlands in this general area.

Potential Impacts

Site 11A—Maintenance and Storage Facility (maintenance facility)

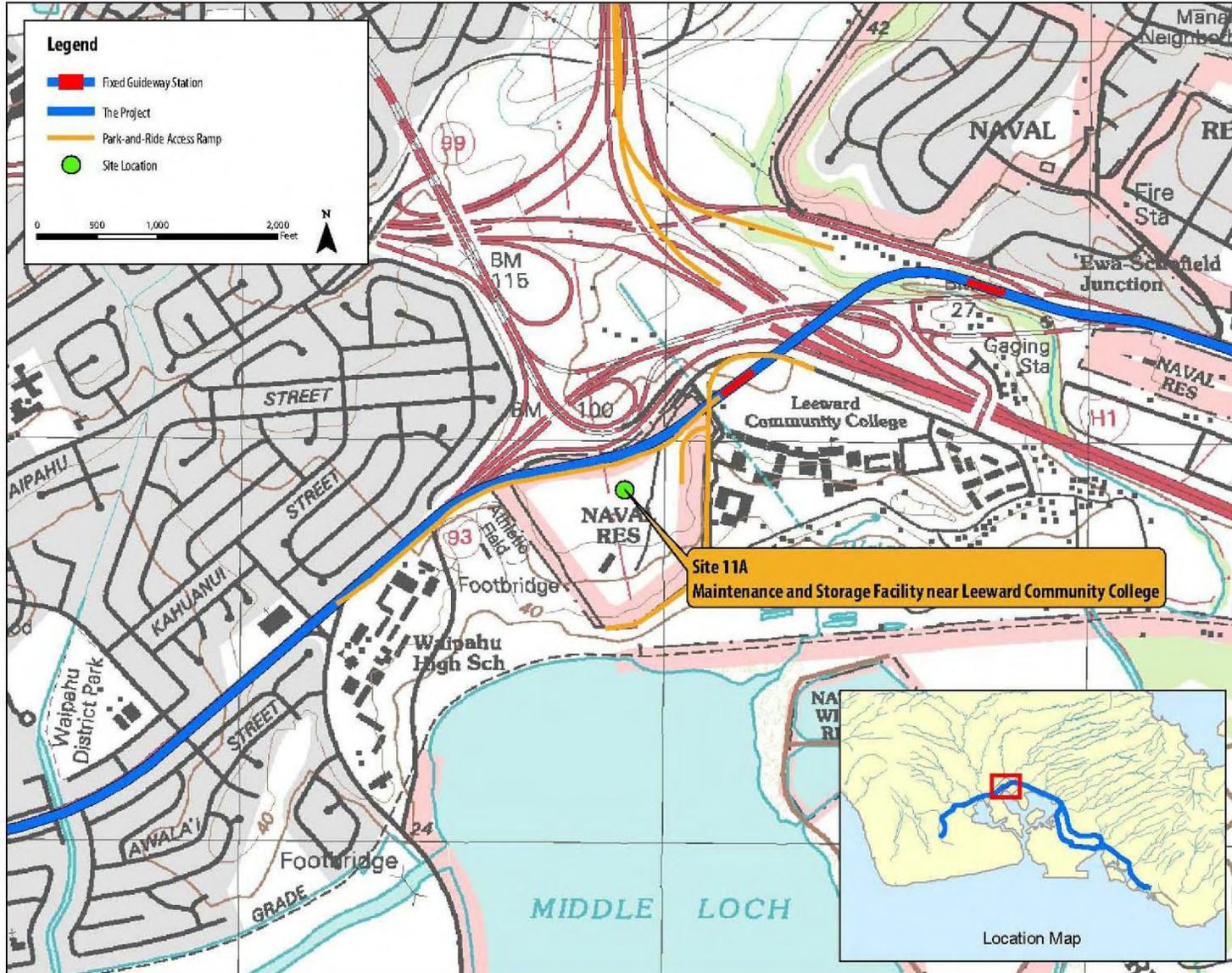
There are waters of the U.S., including wetlands and non-wetland waters, at this location; therefore, no impacts to waters of the U.S. would occur at Site 11A.

Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor)

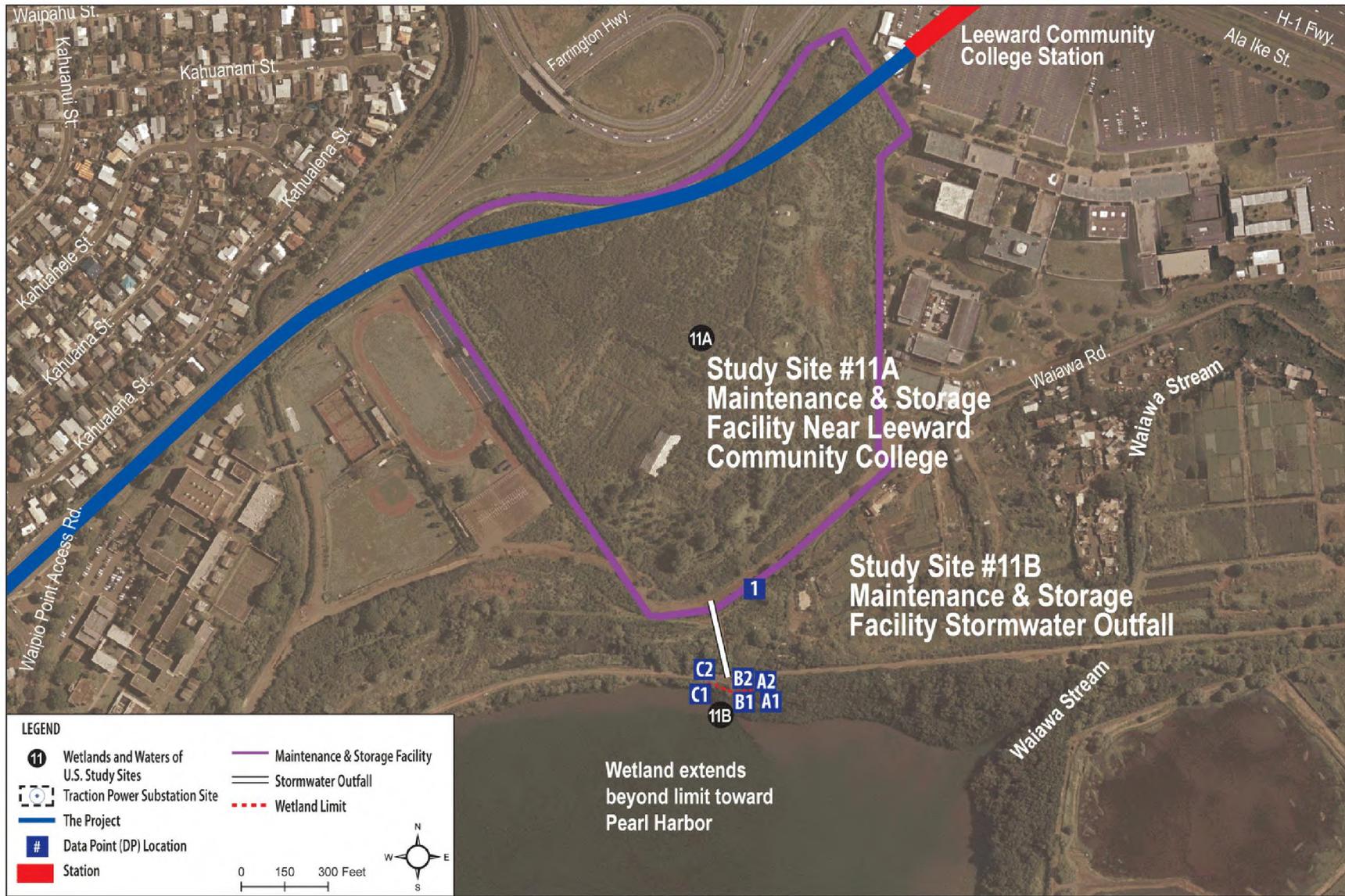
An overflow stormwater outfall associated with the Project's preferred alternative for the maintenance and storage facility is proposed at Site 11B. A littoral wetland system was identified at Site 11B; however, the stormwater outfall will be outside of the delineated

wetland boundary and impacts to the littoral wetland are not anticipated. If adjustments to the project design are required and would result in impacts to the littoral wetland; the potential impacts will be discussed in the Final EIS and the Section 404/10 permit application.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 11A: Lower property line facing west



Photo 11B: Top center of property



Photo 11C: Stormwater pooling location at top of property



Photo 11D: Middle Loch shoreline to the east



Photo 11E: Middle Loch shoreline to the west



Photo 11F: Upper shoreline to the east



Photo 11G: Upper shoreline to the west



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 11a. Maintenance & Storage Facility near Leeward Community College	Date: 7/6/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: E. Guinther, R. Bourke	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Panicum maximum	HERB	FACU	8		
2 Leucaena leucocephala	TREE	UPL	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: n/a (In.) Depth to Free Water in Pit: >12 (In.) Depth to Saturated Soil: >12 (In.)	Remarks:	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0 - 12	A	7.5YR 3/3	none		Sandy clay
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)					
Remarks: Soil extremely dry and difficult to wet, so "sand" could be hard particles of clay. 21.389112 N Latitude, 157.987553 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Remarks: No wetland indicators observed on this parcel.	

Site 21—North of Aloha Stadium

Site Summary

Site 21—North of Aloha Stadium is a two-acre cemetery located to the north of Aloha Stadium in interchange between Moanalua Freeway and Kamehameha Highway (see the following Site 21 maps). The approximate location of Site 21 is 21°22'31.097"N latitude and 157°55'56.112"W longitude.

A small part of this site is mapped (Foote 1972) as Hanalei silty clay. Therefore, an on-site field survey was conducted to investigate the area for the potential occurrence of waters of the U.S. However, the on-site field surveys revealed that this area is a cemetery with no waters of the U.S. nor does it contain areas capable of supporting waters of the U.S. The existing conditions were documented and recorded in the routine wetland data forms (see the following Site 21 form). The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

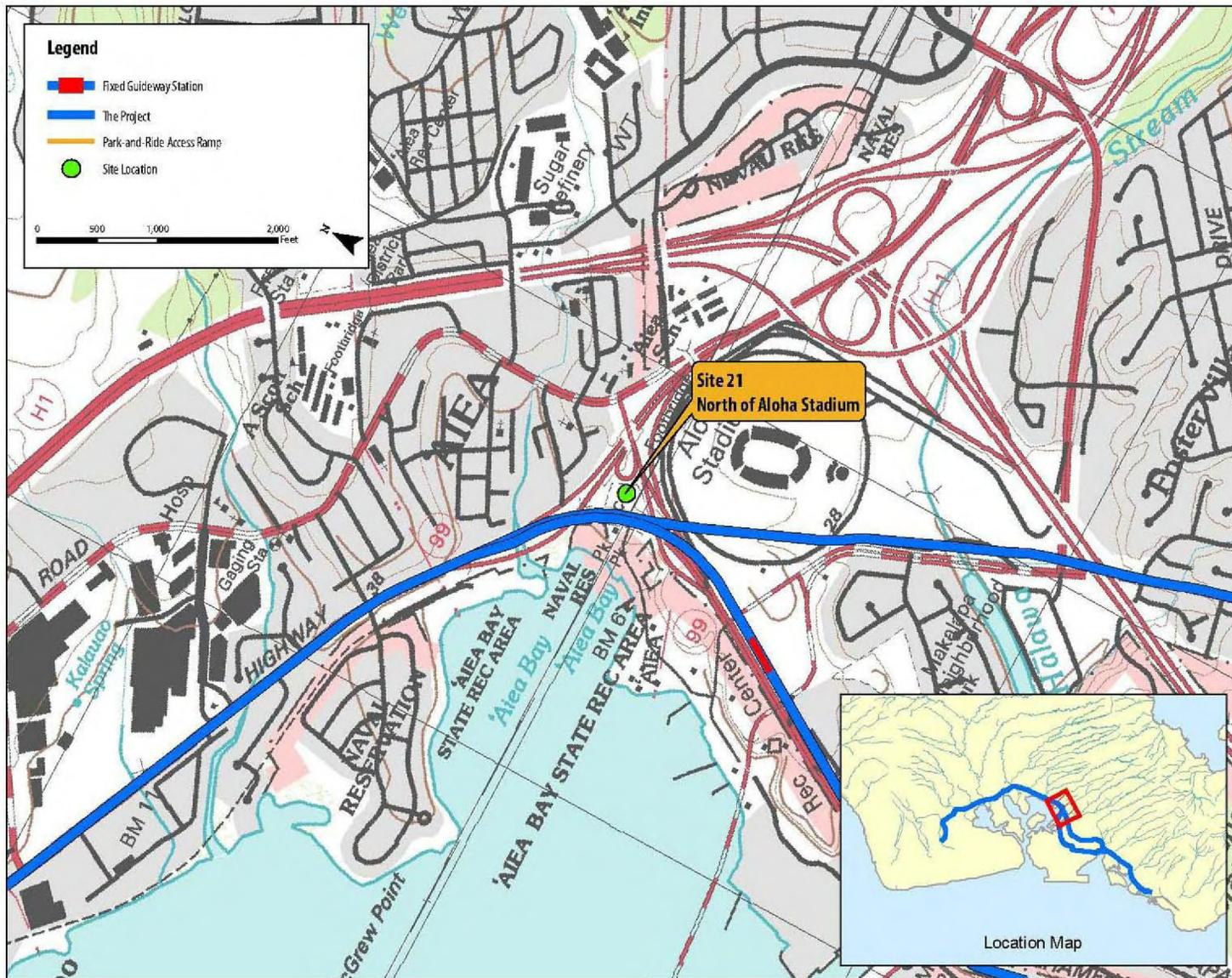
The proposed project site is part of the 9,942-acre Hālawā watershed but has a separate outlet to Pearl Harbor via the City storm drain system.

This site was chosen as a potential wetland because of its hydric soil type and apparent avoidance by the surrounding highway systems. The site was visited on 3-26-09 at 2:30 p.m. under clear no-rainfall conditions as documented in the following photographs. The reason for avoidance by the surrounding highways became immediately apparent as the site was accessed. The site is a historical graveyard with graves dating primarily from the early 1900s. The low area within the parcel has a grated storm drain entrance. No soil cores were taken. There were no wetland plants on the site.

Potential Impacts

There are no waters of the U.S. at this location; thus, no waters of the U.S. would be impacted by the Project at Site 21.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 21A: Soil map shows hydric soils in this historic graveyard

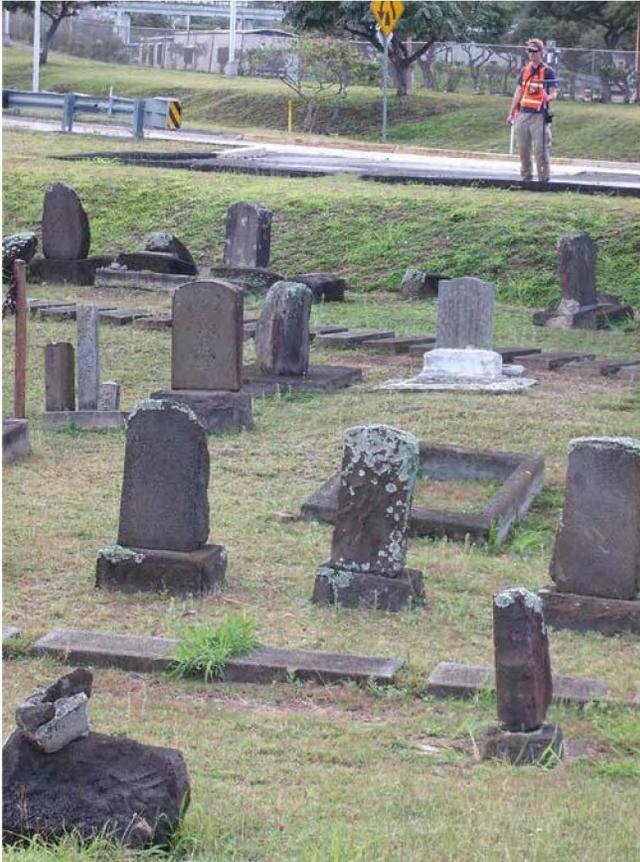


Photo 21B: Drain at low point in cemetery prevents buildup of water on site



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 21. North of Aloha Stadium</u>	Date: <u>3/26/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? <i>(if needed, explain on reverse)</i> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u>Prosopis pallida</u>	Tree	FACU	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks: Mowed lawn grasses and kiawe (Prosopis pallida) trees.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks)	Wetland Hydrology Indicators:	Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
<input type="checkbox"/> Stream, Lake, or Tide Gauge			
<input checked="" type="checkbox"/> Aerial Photographs			
<input type="checkbox"/> Other			
<input type="checkbox"/> No recorded data available	Field Observations:		
Depth of Surface Water: <u>0</u> (In.)	Depth to Free Water in Pit: _____ (In.)		
Depth to Saturated Soil: _____ (In.)			
Remarks: _____			

SOILS

Map Unit Name (Series and Phase): <u>Hanalei Silty Clay</u>	Drainage Class: <u>Somewhat poorly drained</u> <i>Circle</i>				
Taxonomy (Subgroup): <u>Typic Tropaquepts</u>	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>No soil sample obtained.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Remarks: <u>This is a historical graveyard sloping to a low point that drains through a city storm drain.</u>	

Form Content Approved by HQUSACE 3/92

Category II—Concrete-lined Channel Waters of the U.S. Spanned by the Project

Site 6—Hō‘ae‘ae Stream

Site Summary

Site 6—Hō‘ae‘ae Stream is located on Farrington Highway at a dual culvert crossing over Hō‘ae‘ae Stream between Leokane and Leokū Streets in Waipahu. Hō‘ae‘ae Stream is an intermittent stream in a modified channel that drains directly into West Loch, Pearl Harbor, a TNW connected to the Pacific Ocean (see the following Site 6 maps). The elevation at the stream invert below the highway bridge is approximately 8 feet.

During the field surveys, no wetland conditions were observed as the Hō‘ae‘ae Stream is an intermittent stream flowing within a concrete-lined channel. The existing conditions of Site 6 were documented and recorded in the routine wetland determination data form (see the following Site 6 form). The best available information and the on-site field surveys indicate that Hō‘ae‘ae Stream is a non-RPW conveying water flows directly to West Loch, located southeast of the Project. The approximate location of Site 6 is 21°22'45.000"N latitude and 158°1'15.000"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The Hō‘ae‘ae Stream drains a watershed of about 2 square miles wedged between the much larger Honouliuli and Waikele watersheds. There does not appear to be any permanent springs above Farrington Highway, and flow in the concrete-lined channel is generally limited to rainfall runoff and storm drain inputs.

The site was visited on 3-20-09 under clear skies as documented in the following photographs. Site elevation is above high-tide elevation as there was no evidence of tidal flow and measured salinity was zero. The site consists of twin corrugated steel pipes flattened on the bottom, each to a width of 12.5 feet, passing beneath Farrington Highway. Above the highway, water flow is contained in a concrete trapezoidal channel 20 feet across at the bottom with 5-foot-high concrete walls at a 1:1 slope and receives flows from storm drain outlets. Below the highway, water falls from the elevated and overhanging pipe culverts approximately 3 feet to the concrete floor. The concrete trapezoidal channel down from the highway is 30 feet across at the bottom with 1:1 sloped concrete sidewalls varying from 8 to 10 feet in height.

All elevations measured at this location were made to a common point marked on the roadway railing, and the point elevations were determined by a certified surveyor. The elevation of the concrete culvert floor was 9.14 feet above sea level (ASL) on the downstream side of the pipe culvert structure and 16.8 feet ASL on the upstream side. The

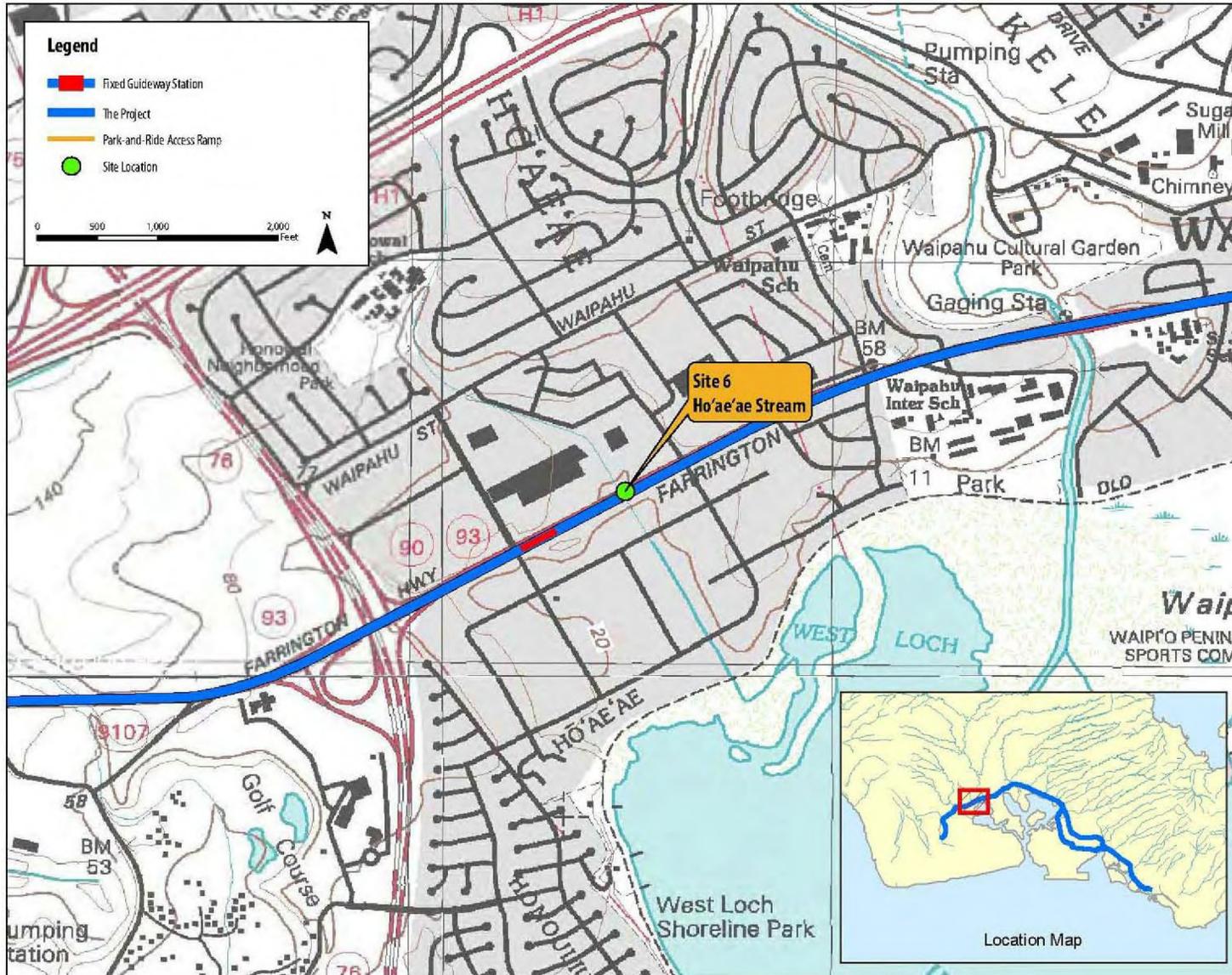
elevation of the OHWM, judged from stain marks on the concrete sidewalls, was approximately 0.8 foot above the concrete floor on the downstream side and 1.6 feet above the floor on the upstream side of the structure under the highway. The slope of the straight stream bed to the next downstream roadway crossing was measured with a level at 0.8-foot drop over 230 feet, or about a 0.3-percent slope.

The overhang of the steel pipes is an effective barrier against upstream migration of native anadromous fauna, although it is unlikely that habitat suitable for native aquatic species would occur on the upstream side of Farrington Highway.

Potential Impacts

The structure associated with the Project would completely span the concrete-lined channel, and impacts are not anticipated to occur below the OHWM (see Appendix B). However, impacts, such as shading of the stream channel, may occur at Site 6 from the Project. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Site Photographs

Photo 6A: Upstream view at mauka bridge



Photo 6B: Urbanized riparian zone near right embankment of mauka bridge



Photo 6C: Downstream view



Photo 6D: Upstream view of bridge and twin drain conduits below highway



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 6. Ho'ae'ae Stream	Date: 3/20/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): _____

Remarks: Vegetation not present; site is a concrete lined drainage channel for an intermittent stream.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: _____ (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	<i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: The site is a concrete channel with culverts beneath the highway. The elevation of the ordinary high water mark, as judged from stains on the concrete sidewalls, was approximately 0.8-feet above the flat stream bed. The flow is limited to rainfall runoff and storm drain flows.		

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil present (all concrete channel).					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters' characteristics at this location.					

Form Content Approved by HQUSACE 3/92

Site 7—Waikele Stream

Site Summary

Site 7—Waikele Stream is located on Farrington Highway at the bridge over Waikele Stream in Waipahu. West Loch is approximately 3,000 feet to the south of Site 7 (see the following Site 7 maps).

During the field surveys, no wetland conditions were observed at Site 7. The existing conditions of Site 7 were documented and recorded in the routine wetland determination data form (see the following Site 7 form). The channel and surrounding lands are mostly paved surfaces. The best available information, including measurements of brackish water conditions (taken at stream invert elevation of 1 foot within the reach of high tides), and the on-site field surveys indicate that the lower reach of Waikele Stream is perennial (RPW) and discharges directly into West Loch, Pearl Harbor, a TNW connected to the Pacific Ocean. The approximate location of Site 7 is 21°22'59.000"N latitude and 158°0'39.000"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 30,985-acre Waikele watershed is the largest watershed on O'ahu draining the Schofield plateau between the Ko'olau and Wai'anae Mountain Ranges. Waikele is a second-order stream with a length of about 10 miles, receiving tributary flows from Kīpapa and Waikakalaua Streams, draining the Ko'olau Mountain Range. Waikele Stream is intermittent in its upper reaches draining the Wai'anae Range and perennial (interpreted) in its middle reach.

The site was visited on 3-26-09 at 8:00 a.m. under clear skies as documented in the following photographs. Twin highway bridges span Waikele Stream with the proposed right-of-way aligned between the bridges. Approximately 130 feet upstream of the mauka bridge (west-bound lanes), the USGS has placed a shallow weir (lowhead dam) across the width of the stream. From just below this point out to West Loch, the stream is contained within a concrete trapezoidal channel. Downstream of the makai bridge (east-bound lanes), the wetted channel is 55 feet wide. The top of the channel is 110 feet wide with a total channel depth of approximately 33 feet. All elevations at this site were made to a common point marked on the bridge railing, and the elevation of the mark was determined by a certified surveyor. The OHWM is estimated to be at 4.35 feet above the concrete bed of the culvert, as evidenced by staining on the concrete side wall. Collection of wrack on bridge pilings approximately 17 feet above the water level is likely due to a recent flooding event.

The USGS supports several gages along this stream, the lowest of which (No. 16213000) is at an elevation of 1.37 feet, approximately 130 feet upstream of Farrington Highway. The elevation of 1.37 feet is HILocal with a datum of mean sea level (MSL) and is, therefore, within the range of the higher high tides. Continuous flow measurements are available for this gage site since 1952, as are various water-quality measurements taken over the same period of time. The highest annual peak flow recorded during this period was about 13,500 cfs, with five occurrences close to 12,000 cfs. Roughly half of the annual peak flow

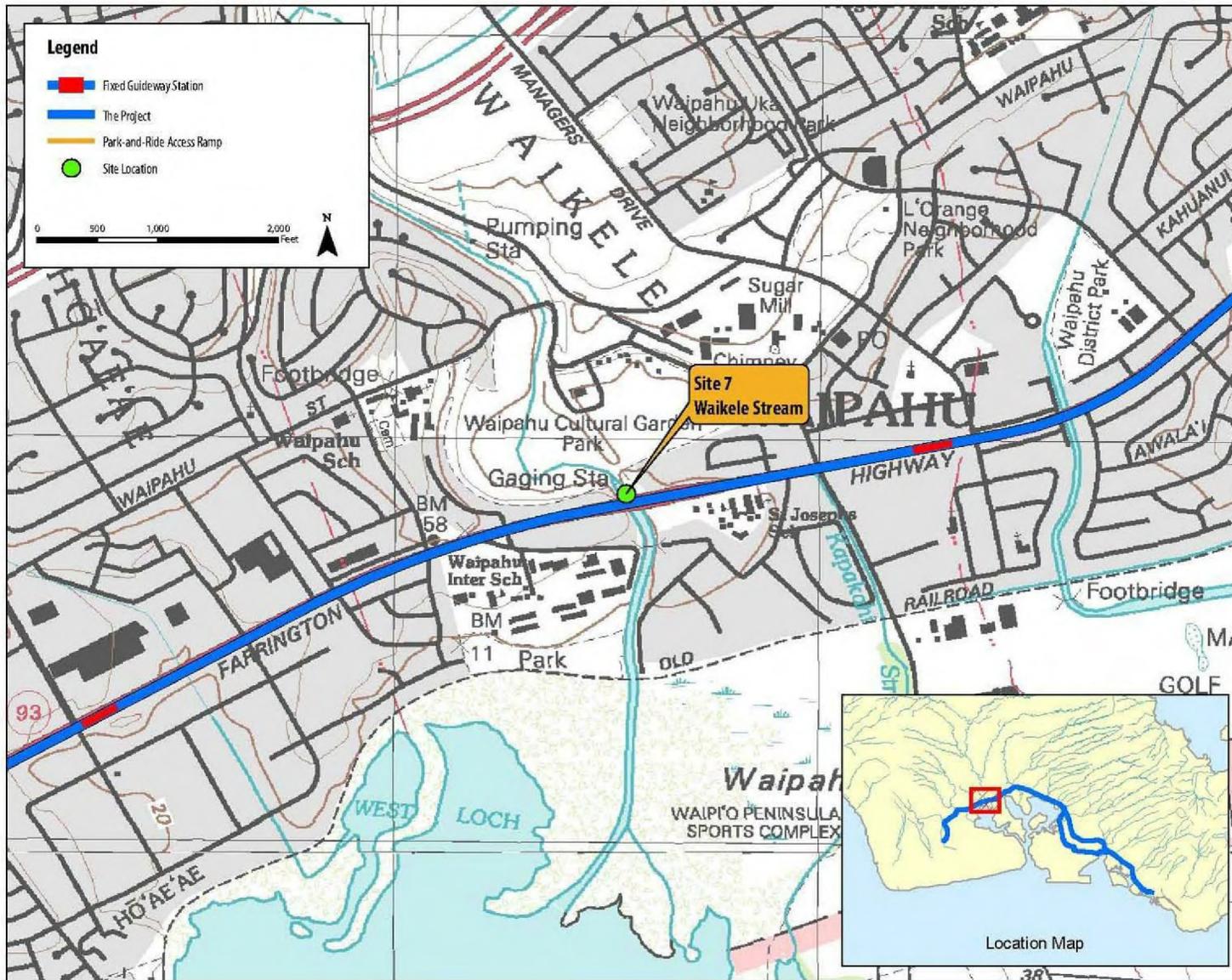
readings were above 5,000 cfs. The annual mean flow from 1952 to 2008 varied from about 19 to 78 cfs, with an average of about 40 cfs. Bank-full flow of 1,200 cfs is estimated by examining 10 years of daily data from 1999 to 2009 and represents the mean daily flow rate exceeded six times (on average, every 1.5 years) during this period. A flow rate of 1,200 cfs represents a stream depth of about 5 feet according to the gage rating curve. This 5-foot depth compares relatively well with the 4.35-foot estimated from the stain line on the concrete sidewall. USGS measurements of conductivity commonly show the presence of low concentrations of salt (>500 mS/cm) during periods of low stream flow. At the time of the site visit, the water in the stream was clear with low flow (21 cfs) and a registered salinity of 0.5 ppt.

Waikele Stream is known to support a broad range of native and introduced fish species. Particularly at this upper edge of the estuary reach, there are likely to be a wide variety of resident and migrating fish species present.

Potential Impacts

The Project would completely clear-span the concrete-lined channel (see Appendix B), and impacts are not anticipated to occur below the OHWM. However, impacts, such as shading of the concrete-lined channel, may occur as a result of the Project. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Site Photographs

Photo 7A: USGS weir upstream of site



Photo 7B: Makai bridge looking down into line stream channel



Photo 7C: Downstream view of left embankment (note 30-foot-tall concrete channel wall)



Photo 7D: Downstream right bank



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 7. Waialeale Stream	Date: 3/26/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): _____

Remarks: No vegetation present in concrete channel.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 16 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: USGS Gage No. 16213000. The ordinary high water mark appears to be about 3.0 feet above the existing water level (1.35 foot depth) as evidence from staining on the concrete side wall. Channelized flow with 30+ foot high concrete walls prevent wetland conditions from forming adjacent to stream.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:		<input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime		<input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils	
		<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)			
Remarks: No soils present (concrete). Stream bed material not investigated.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters' characteristics at this location.					

Form Content Approved by HQUSACE 3/92

Site 10—Waipahu Canal Stream

Site Summary

Site 10—Waipahu Canal Stream is located at the 900 block on Farrington Highway, a bridge crossing over Waipahu Canal in Waipahu. At Site 10, the Waipahu Canal Stream is confined within a concrete-lined structure that drains the eastern end of Waipahu (see the following Site 10 maps). Site 10 is located at approximately 21°23'5.400"N latitude and 158°0'3.000"W longitude.

During the field surveys, no wetlands were observed at Site 10. The existing conditions were documented and recorded in the routine wetland determination data form (see the following Site 10 form). The approximate elevation of the stream invert below the highway bridge is -2 feet. The best available information and on-site field surveys indicate that the Waipahu Drainage Canal is an estuarine waterbody and is a RPW/TNW, at this location, connected to Middle Loch of Pearl Harbor, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The watershed is a subcomponent of the 2,200-acre Kapakahi watershed but has its own drainage area of about 1,000 acres extending through the Ted Makalena Golf Course, up through urban neighborhoods to an area above the H-1 Freeway to receive flow from the Waikele Country Club golf course. Historically, the drainage was cross-connected with the Kapakahi Stream into East Loch and fed the “Eo” fish pond on the grounds of what is now the Ted Makalena Golf Course. The canal is designed specifically for flood control.

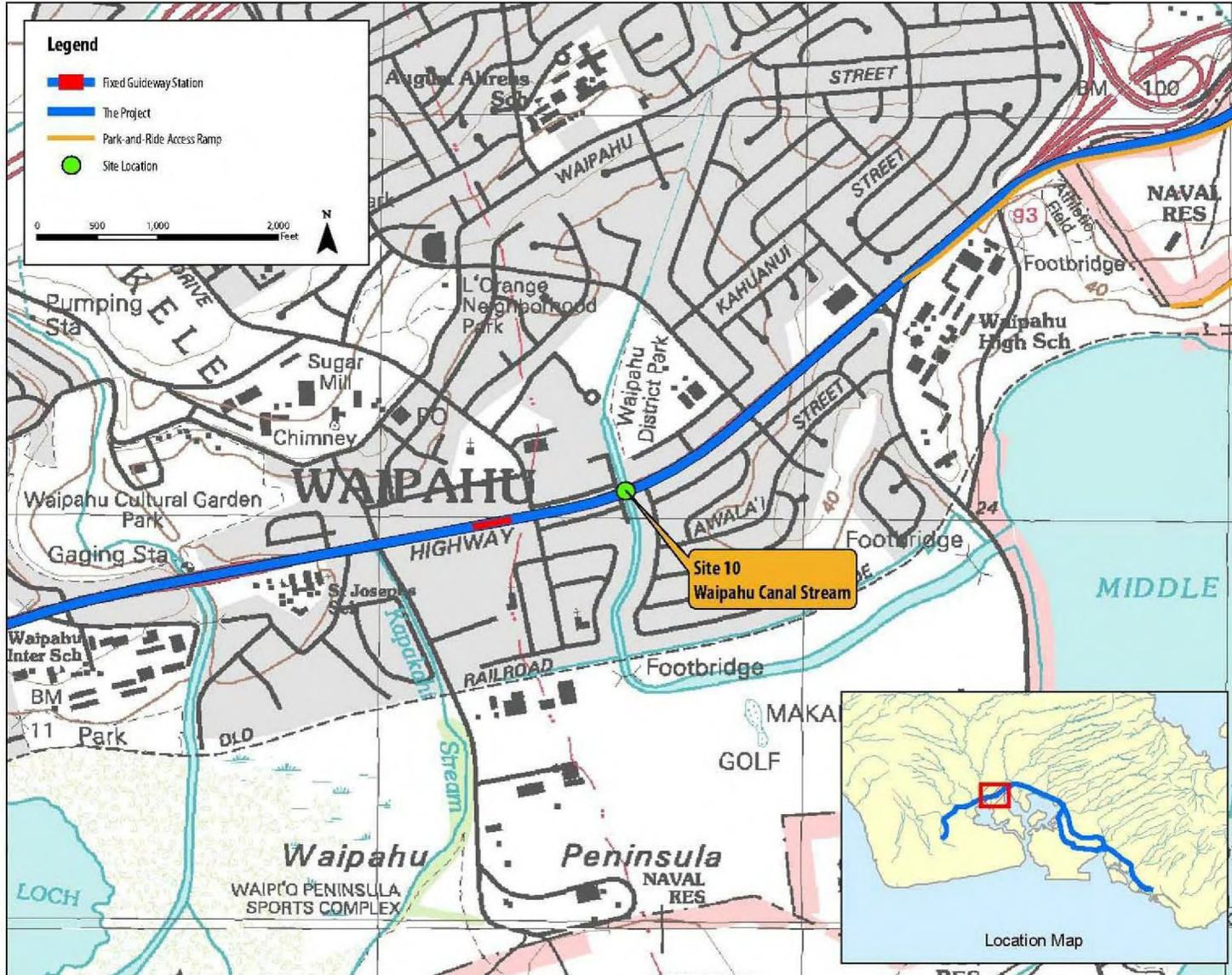
The site was visited on 3-23-09 at 12:15 p.m. under clear skies as documented in the following photographs. This 43-foot-wide canal has vertical, concrete side walls with standing water in both directions from the bridge at an average depth of 3.35 feet. All elevation measurements were made to a common point marked on the bridge railing, and the elevation of that point was determined by a certified surveyor. The tide (Honolulu tide gage) at the time of the survey was -0.17 foot MSL and the water elevation at the site was 0.11 foot ASL. The OHWM, as judged from stains on the concrete walls, was at a height of 5.16 feet above the bed of the culvert.

There is no vegetative growth in the stream or on the adjacent concrete banks. No stream fauna was noted in the water at the site.

Potential Impacts

The Project would completely clear-span Site 10 (see Appendix B), and impacts are not anticipated to occur below the OHWM. However, impacts, such as shading of the stream channel, may occur as a result of the Project. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 10A: Upstream right embankment



Photo 10B: Upstream left embankment



Photo 10C: Downstream left embankment



Photo 10D: Downstream right embankment



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 10. Waipahu Canal Stream	Date: 3/23/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: T. Koehler, T. Mulitauaoepele	State: HI
Do Normal Circumstances exist on the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks: No vegetation is growing in the concrete-lined channel.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 42 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: The elevation of the ordinary high water mark, as judged from stains on the concrete sidewall, was approximately 10.22-feet above the existing water level.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: No soil present; all concrete-lined channel.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Form used to document non-wetland waters' characteristics at this location.		

Form Content Approved by HQUSACE 3/92

Site 14—Pearl City Stream

Site Summary

Site 14—Pearl City Stream is located along Kamehameha Highway at the culvert outlet for Waiau Stream (Pearl City Stream). Although perhaps seasonally flowing, this stream is contained within a system of open and covered concrete culverts through Pearl City and empties into the East Loch of Pearl Harbor (TNW). The approximate location of Site 14 is 21°23'36.000"N latitude and 157°58'7.000"W longitude (see the following site 14 maps). The elevation of the stream invert below the Highway Bridge is approximately 23 feet.

During the on-site field surveys, no wetlands were identified; however, the perennially flowing Pearl City Stream was observed at Site 14. The existing conditions at Site 14 were documented and recorded in the routine wetland determination data form (see the following Site 14 form). Based on the best available information and the on-site field surveys, at Site 14 Pearl City Stream is an RPW discharging into East Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The Pearl City Stream is contained within the 7,797-acre Waimalu watershed but has its own separate outfall to East Loch. Sometimes known as the Waimano Channel because it flows from the south side of Waimano Ridge, it is not to be confused with the larger Waimano Stream tributary of the Waiawa Stream in the adjacent watershed to the northwest. On at least one bridge crossing, near Waiau District Park, the stream is also named "Waiau," although it does not connect with the Waiau Spring just above Kamehameha Highway and has a separate outlet to the harbor.

The site was visited on 3-28-09 at 1:30 p.m. under clear skies as documented in the following photographs. Twin two-lane bridges of Kamehameha Highway span the 32-foot-wide, 10-foot-deep concrete box culvert canal. Above the highway, the stream is completely contained in two divergent channels underneath the Pearl City Shopping Center. Above the Center, the Waimano (Waiau) Stream proceeds about 8,000 feet up through heavily urbanized Pearl City and then an additional 15,000 feet up onto the lower slopes of the Ko'olau Mountain Range in a relatively narrow valley. Downstream from the highway, the channelized stream flows 1,500 feet underneath the H-1 Freeway, where the concrete box culvert ends, and the stream flows an additional 1,000 feet into a mangrove-covered delta within Pearl Harbor. The USGS has collected occasional flow measurements at a site directly below the freeway at an elevation of 2 feet ASL. The maximum of 57 flow measurements obtain since 1967 is 1.44 cfs, with the average flow about 0.7 cfs. Obviously, the peak flow must be significantly higher than this, given the 1,000+ acre size of the contributing watershed, but no other peak flow measurements have been made.

A transect along the bridge indicated a maximum depth of less than 0.1 foot. There was flow in the concrete box culvert, but it was too low to measure effectively. Water staining on the concrete sidewalls indicates an upstream and downstream OHWM elevation of 1.3 feet above the concrete floor. The upstream and downstream concrete bed elevations are

13.88 feet and 15.89 feet ASL, respectively. All elevations were made to a common point marked on the bridge railing and the elevation of that point determined by a certified surveyor. There was insufficient water flow to support fauna within the stream at this location.

Potential Impacts

The Project would clear-span the Pearl City Stream at the Site 14 location. However, potential impacts may occur to the Pearl City Stream that would most likely be in the form of shading of the concrete-lined channel. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

Aerial Site Map



Site Photographs

Photo 14A: Downstream left embankment



Photo 14B: Downstream right embankment



Photo 14C: Upstream right embankment



Photo 14D: Upstream left embankment



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 14, Pearl City Stream	Date: 3/28/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks: Vegetation absent; concrete-lined channel.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 0 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	<i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: USGS Gage No. 16223000 - occasional measurements flow average 0.7 cfs.		

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil or sediment present in concrete-lined channel.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters' characteristics in this location.					

Form Content Approved by HQUSACE 3/92

Site 19—‘Aiea Stream

Site Summary

Site 19—‘Aiea Stream is located on the the south side of Kamehameha Highway where a viaduct crosses over ‘Aiea Stream. This location is only a short distance upstream from the stream mouth where it enters into the ‘Aiea Bay, East Loch, Pearl Harbor (see the following Site 19 maps). The approximate location of Site 19 is: 21°22'37.177"N latitude and 157°56'3.884"W longitude.

During the on-site field surveys, the ‘Aiea Stream was observed within a concrete-lined channel and the existing conditions were documented and recorded in the routine determination data form (see the following Site 19 form). Based on the best available information and the on-site field surveys, the ‘Aiea Stream is an RPW discharging flows into the East Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 1,301-acre ‘Aiea watershed consists of a single narrow valley that extends only about half way to the top of the Ko‘olau Mountain Range. Although the stream is listed as perennial, there is no record of it having been gauged for flow, and the stream is often noted to dry up during summer months in its mid-reaches. At least 80 percent of the watershed is either urban or business, and the stream has been channelized through much of its urban length.

The site was visited on 3-24-09 at 2:00 p.m. under clear skies as documented in the following photographs. The stream passes beneath three bridges. Above the bridges, the stream is contained within a 40-foot-wide box culvert with vertical concrete walls extending 6 feet above the water and topped with a chain link fence. Kamehameha Highway passes over the stream in a single unsupported span essentially creating a 90-foot-long box culvert. Downstream of the highway, the stream widens to 72 feet and passes beneath the bikeway foot bridge, which utilizes the old railroad bridge, supported by four sets of bridge pilings. The elevated freeway onramp is supported by a pair of concrete pilings at the center line of the channel. Seaward of the freeway on-ramp, the concrete sidewalls end and the stream widens into a mouth and delta extending out into East Loch. The observed deposition delta beyond the Project presently bends the stream channel to the left (south) with the delta supporting the growth of grasses, pickleweed, and mangrove. The mangrove here was completely cleared in 2007 (WCP 2007) and numerous new mangrove saplings are now taking hold.

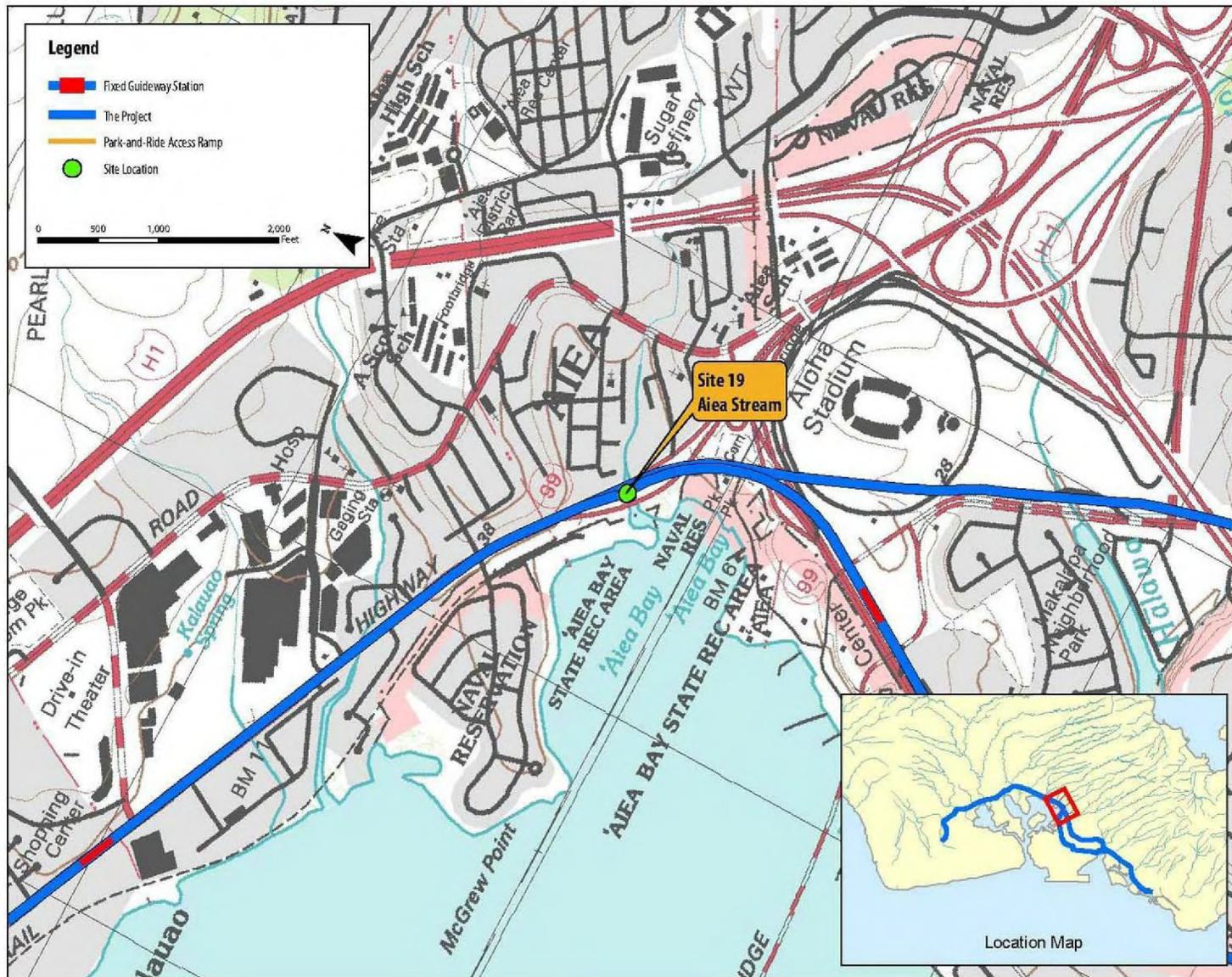
At the time of the site survey, the predicted Honolulu tide was approximately 0.38 foot above MSL and rising. The OHWM, evidenced by staining on the concrete, was measured at 2.25 feet above the bed of the channel, or an OHWM elevation of 1.7 feet above MSL. There was no difference between the upstream and downstream elevations of the OHWM.

The water in the stream was turbid, with visibility limited to about 1 foot. The refractometer-measured salinity was 24 ppt. Fish life in the stream was not quantified but appears to be typical of that found at stream mouth estuaries in Pearl Harbor. There are no plants on the vertical sidewalls of the stream banks. The mudflats of the stream delta may provide foraging habitat for Hawaiian Stilt.

Potential Impacts

The Project would completely clear-span Site 19; therefore, impacts are not anticipated to occur to waters of the U.S. at this location. However, impacts, such as shading of the stream channel may occur at Site 19 from the Project. If changes in the design occur and impacts are anticipated, those impacts will be reported in the Section 404/10 permit application and/or the Final EIS.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 19A: Upstream view at mauka bridge



Photo 19B: Mauka bridge facing west



Photo 19C: Downstream left embankment below Moanalua Freeway



Photo 19D: Downstream right embankment below Moanalua Freeway



Photo 19E: Upstream view at right embankment under Moanalua Freeway



Photo 19F: Water opening view at left embankment



Photo 19G: Upstream view of makai bridge



Photo 19H: Vegetation along harbor shoreline



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 19. Aiea Stream	Date: 3/24/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Rhizophora mangle</i>	Shrub	OBL	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: At and closely adjacent to the site, occur very scattered juvenile mangroves below vertical concrete-lined banks.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 30 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: This is a channelized stream mouth transitioning to an estuary delta; area is tidal.	

SOILS

Map Unit Name (Series and Phase): _____ Taxonomy (Subgroup): _____	Drainage Class: _____ Field Observations Confirm Mapped Type? Circle Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil sample examined. Vertical concrete-lined banks limit material to stream deposited sediment.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters' characteristics for this location.					

Form Content Approved by HQUSACE 3/92

Site 23—Hālawā Stream (Mauka-Salt Lake)

Site Summary

Site 23—Hālawā Stream (Mauka-Salt Lake) is located at the Salt Lake Boulevard Bridge over the Hālawā Stream. At this location, the stream is confined to a concrete-lined channel and is a non-tidal location. Sediment deposits downstream support vegetation, giving the stream bed a natural appearance. Hālawā Stream is perennial, although flow in this lower reach may be seasonal. The approximate location of Site 23 is 21°22'4.000"N, latitude and 157°55'48.000"W longitude (see the following Site 23 maps).

During the on-site field surveys, the Hālawā Stream was observed within a concrete-lined channel and the existing conditions were documented and recorded in the routine determination data form (see the following Site 23 form). Based on the best available information and the on-site field surveys, Hālawā Stream is a RPW that flows into East Loch (see Site 22), a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 9,442-acre Hālawā watershed drains the large Hālawā Valley to the peak of the Koʻolau Mountain Range.

The site was visited on 3-26-09 at 11:00 a.m. under clear skies as documented in the following photographs. From 100 feet below the Salt Lake Boulevard Bridge and up along the Aloha Stadium parking lot, the stream is contained within a concrete trapezoidal channel. The channel is 82 feet wide downstream of the bridge and 55 feet wide upstream of the bridge. Upstream of the bridge, the top-of-bank width (top of bank to top of bank) is 92 feet, with a total channel depth of approximately 12 feet. Downstream of the bridge, the stream transitions to a relatively natural-looking channel about 80 to 100 feet wide. In addition to gravel substrate, riffle complexes were noted approximately 200 to 300 feet downstream of the bridge. Beyond the gravel beds, the channel appears to become estuarine, as mangroves occur along either bank. During the on-site field surveys, the tide was only about -0.32 foot above MSL and rising; however, there was no evidence to indicate that the tide came upstream as far as the Salt Lake Boulevard bridge.

The water elevation of the stream was referenced to a marked point on the bridge railing and the elevation of that point determined by a certified surveyor. The upstream OHWM was observed at approximately 2.01 feet (elevation 5.58 feet above MSL) above the channel bed (elevation 3.57 feet above MSL), as evidenced by staining on the concrete and the buildup of vegetative matter. The channel bed widens and falls proceeding downstream under the bridge to a stream bed elevation of 0.77 feet above MSL. The downstream OHWM was observed at approximately 2.01 feet (elevation 2.78 feet above MSL) up from the channel bed. The average OHWM under the bridge is 4.18 feet. It is likely that the upper reach of the highest tides comes close to the bottom of the concrete channel bed downstream from the bridge. The USGS supports several gages along this stream, the lowest of which (No. 16227000) is at an elevation of 16 feet approximately

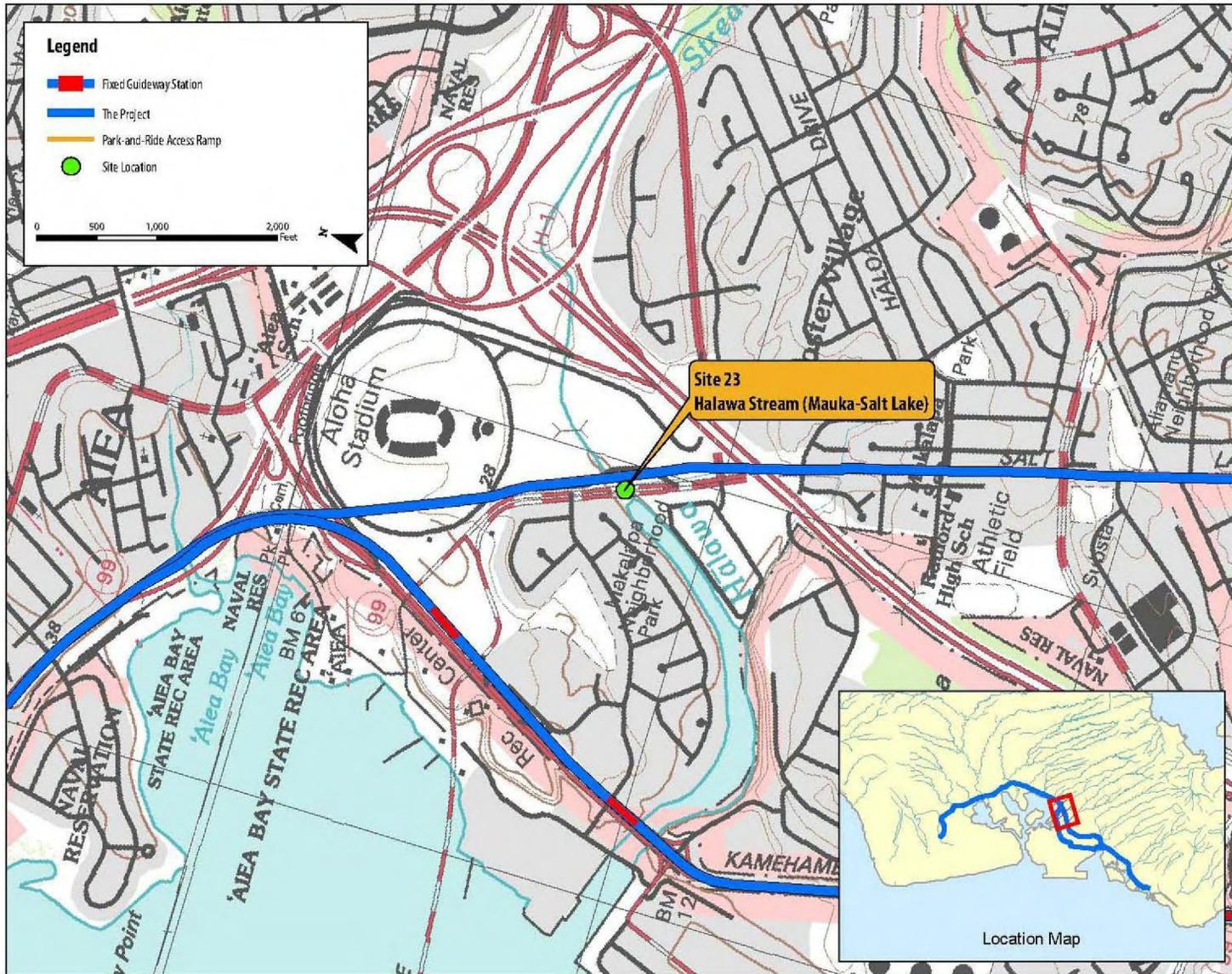
3/4-mile upstream of Salt Lake Boulevard below the H-1A Moanalua Freeway. Flow measurements taken between 1954 and 1979 show a maximum peak flow of about 6,500 cfs, with two readings above 4,000 cfs and roughly half of the annual peak flow readings above 2,000 cfs. The annual mean flow from 1954 to 1961 varied from 6 to 18 cfs.

At the time of the site visit, the water in the stream was clear with minimal flow (<1 cfs) and displayed a salinity reading of zero. There was insufficient flow in the stream beneath the bridge to support fishes other than small tilapia and either mollies or mosquitofish. Umbrella sedge, a facultative wetland species, was seen growing in the center of the concrete channel, but there were no accumulated sediments on the concrete channel.

Potential Impacts

Site 23 is located along the Salt Lake alignment, which was not selected as the preferred alignment. Therefore, no impacts to waters of the U.S. would occur at this location.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 23A: Upstream right embankment



Photo 23B: Upstream left embankment (note umbrella sedge in center channel)



Photo 23C: Downstream left embankment



Photo 23D: Downstream right embankment (note mangroves at a distance along downstream channel)



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 23. Halawa Stream (Mauka-Salt Lake).	Date: 3/26/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Cyperus alternifloris	HERB	FACW	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: No plants of significance in hardened channel
 Umbrella sedge at edge of channel on sediment bar.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 0.5 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: Primary Indicators: <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: USGS Gage No. 1622700.		

SOILS

Map Unit Name (Series and Phase): _____ Taxonomy (Subgroup): _____	Drainage Class: _____ Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: No sample taken. Channel is concrete lined, with coarse sediment bars present in channel over concrete.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Form used to document non-wetland waters' characteristics at this location.	

Category III—Modified and Unmodified Channel Waters of the U.S. Spanned by the Project

Site 4—Honouliuli Stream

Site Summary

Site 4—Honouliuli Stream is located on the Farrington Highway bridge over Honouliuli Stream. Honouliuli Stream is an interrupted perennial stream that discharges into West Loch, Pearl Harbor, a TNW (tidal embayment) connected to the Pacific Ocean (see the following Site 4 maps). The approximate elevation at the stream invert below the existing highway bridge is 65 feet.

During the field surveys, no wetland conditions were observed at the site. The existing conditions for Site 4 were documented and recorded in the routine wetland determination data form (see the following Site 4 form). Honouliuli Stream, at this location, is intermittently flowing; however, the lower Honouliuli Stream is perennial in nature and is influenced by springs. Agricultural withdrawals and additions (termination of Waiāhole Ditch, for example) influence stream flows upstream of the project crossing. Therefore, it is uncertain if perennial reaches are naturally present above the site.

The on-site field surveys, stream gage data, and various resources indicate that the Honouliuli Stream (Site 4) is an RPW that receives and conveys water flows during portions of the year. The approximate location of Site 4 is 21°22'27.000"N latitude and 158°02'0.000"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 12,640-acre Honouliuli watershed is adjacent to the Waikele watershed but only receives runoff from the east face of the Wai'anae Mountain Range. Because this portion of the range is typically in the tradewind rain shadow of the Ko'olau Mountain Range, these slopes and the stream in the mid to upper ranges are typically dry. However, due to the size of the watershed, when there is rainfall, the runoff can be highly significant. The stream is, therefore, highly flashy in nature. The lower reaches of the stream as they approach West Loch receive significant groundwater inflow from springs and the stream becomes perennial. The large majority of the watershed is either farm land or preservation land with minor urban and golf course land use in the lower reaches.

The site was visited on 3-20-09 at mid-day under clear no-rainfall conditions as documented by the following photographs. The previous week there had been a significant rainfall in the watershed resulting in a peak flow of 9 cfs through this site. The proposed right-of-way passes just north or upslope of the single two-lane Farrington Highway Bridge at this site. Upslope of the bridge, the stream passes in an incised channel through agriculture lands to the H-1 Freeway above which the Honouliuli Gulch continues to the top

of the Waiʻanae Mountain Range. Below the bridge, the stream banks widen through the landscaped grounds of the Kāhi Mōhala Behavioral Health Center and then pass through design channels and swales within West Loch Golf Course, under New Fort Weaver Road and to West Loch.

The active stream channel is about 10 feet wide beneath the highway bridge and 8 feet wide in the upstream incised sections. The upstream riparian buffer is completely covered with long grass hanging over a dirt and mud bed. The bridge opening is 40 feet wide between vertical concrete walls that support a USGS staff gage (16212500) at an elevation of 64 feet. A 40-year record at this gage (1968–2008) displayed a peak flow of 3,500 cfs with annual peak flows exceeding about 600 cfs half the time. There is no average daily flow at this site because the stream is typically dry. At the time of observation, there was a flow estimated at 1/10 cfs, likely remnant from a storm the previous week during which a flow rate of 9 cfs had been measured by USGS personnel on March 14. Because of the nature of the gage at the site, it cannot be ascertained whether or not there is flow at this station more than 3 months per year. Best professional judgment suggests that this site has flowing water less than 3 months per year under normal conditions.

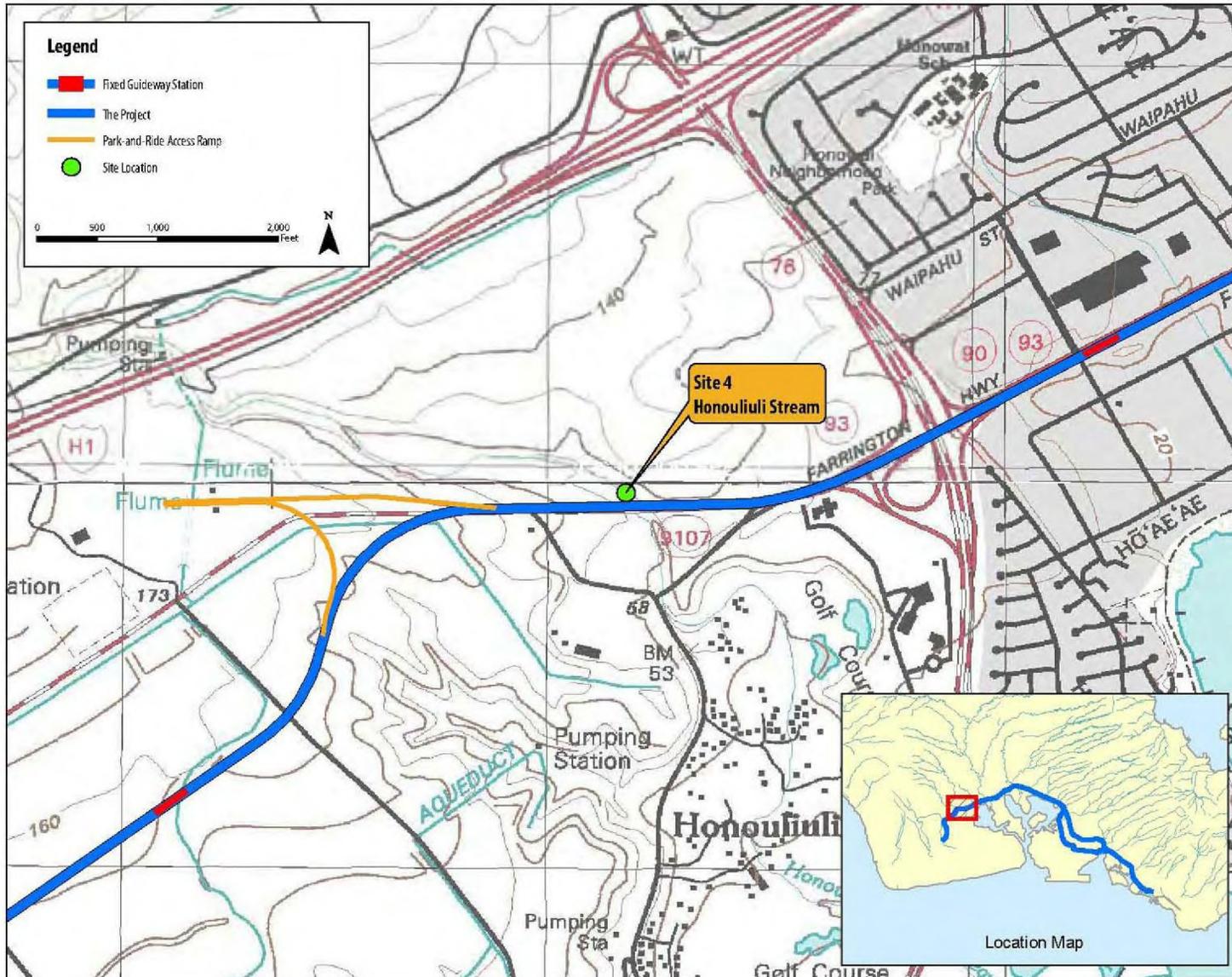
The OHWM was estimated by examination of the stream channel cross section under the bridge and by water marks on the bridge abutment at about 5 feet above the stream bed. All elevations were made to a common point marked on the bridge railing, and that point's elevation was determined by a certified surveyor. The elevation of the stream bed was surveyed at 61.55 feet above MSL and the OHWM at that point is 5.0 feet higher. This OHWM elevation corresponded to a reading on the fixed USGS gage of 5.1 feet which, according to the USGS rating curve for this site, corresponds to a flow rate of about 1,350 cfs.

The prevalence of farmed lands in the upper watershed, the observed muddy condition of the stream bed, and experience with significant sediment loads in the downstream area indicates that this stream likely delivers significant sediment loads to West Loch.

Potential Impacts

The Project crosses Site 4 adjacent to the Farrington Highway bridge (see Appendix B). The potential impacts that may occur at Site 4 from the Project include shading of the stream channel and clearing of adjacent vegetation. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 4A: Upstream view



Photo 4B: Upstream left embankment showing USGS gage station



Photo 4C: Downstream view (note large quantity of red dirt in stream bed)



Photo 4D: View of erosional gulch overgrown with non-wetland plants



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 4. Honouliuli Stream	Date: 3/20/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Panicum maximum</i>	HERB	FACU	8		
2 <i>Leuceana leucocephala</i>	SHRUB	UPL	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: Wetland vegetation absent; streambed.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: 0 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	
Remarks: USGC Gage No. 16212500. This is a modified streambed subject to freshet flows. Soils drain in the absence of rainfall. The ordinary high water mark was estimated by examination of the stream channel cross section under the bridge and stain marks on the concrete sidewall.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____ Circle				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)					
Remarks: Soil not tested. Coarse sediment in streambed.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters' characteristics at this location.					

Form Content Approved by HQUSACE 3/92

Site 9—Kapakahi Stream

Site Summary

Site 9—Kapakahi Stream is located at the Farrington Highway bridge over Kapakahi Stream adjacent to Waipahu Depot Road in Waipahu. Kapakahi Stream is a realigned channel that serves to drain a portion of Waipahu (see the following Site 9 maps). Brackish (and tidal) waters occur in the channel a short distance downstream of the site. The approximate elevation at the stream invert below the highway bridge is 4 feet.

During the field surveys, no wetlands were observed at Site 9. The existing conditions at Site 9 were documented and recorded in the routine wetland determination data form (see the following Site 9 form). Kapakahi Stream is a perennial channel regularly cleared to maintain flood relief. The best available information and the on-site field surveys indicate that Site 9 is a RPW draining into West Loch of Pearl Harbor, a TNW connected to the Pacific Ocean. The approximate location of Site 9 is 21°23'0.600"N latitude and 158°0'23.500"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

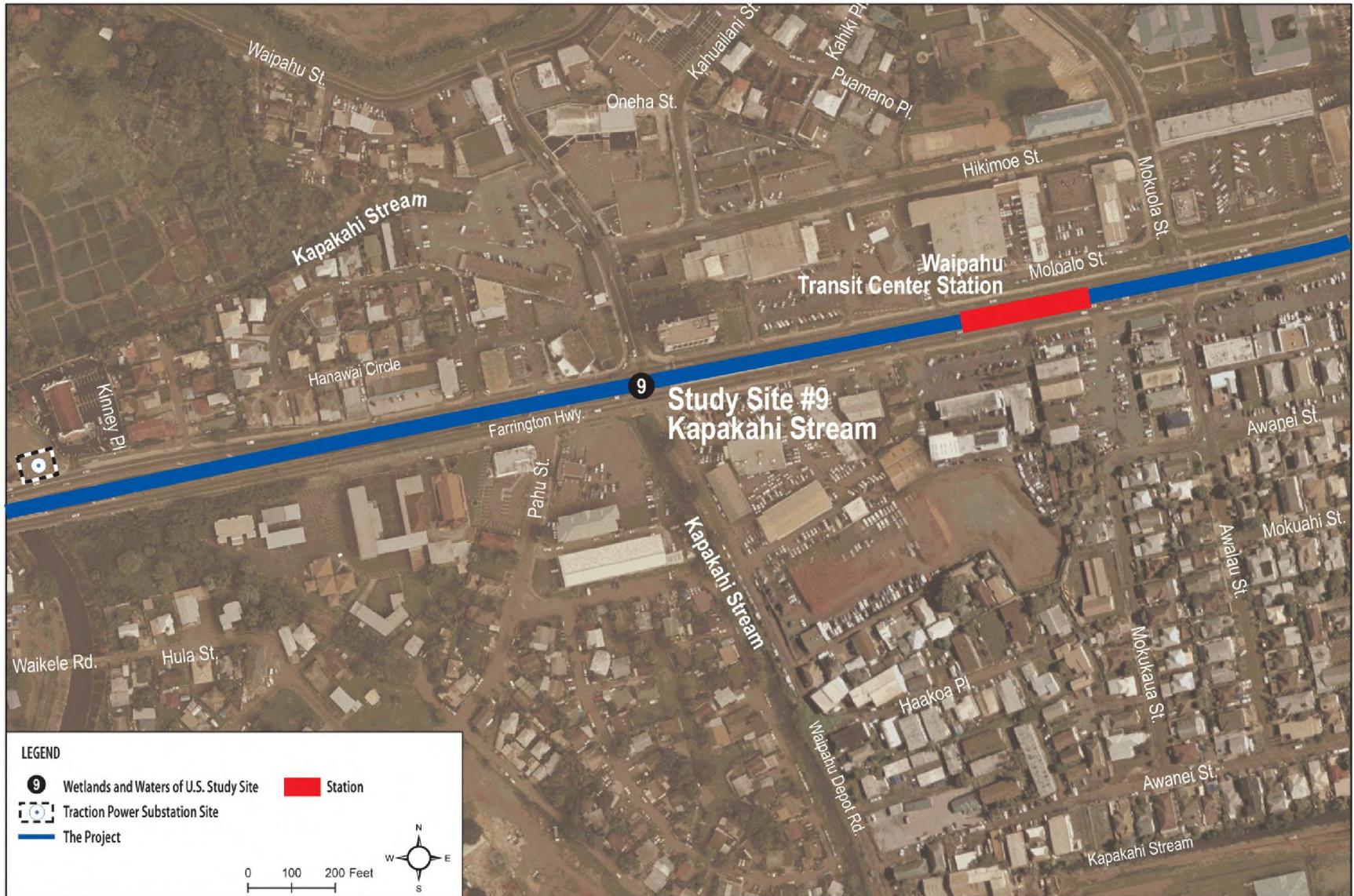
Although the Kapakahi watershed encompasses 2,200 acres, drainage from the stream is limited to only about 280 acres. The stream originates in the 41-acre Waipahu Cultural Garden Park just north of Farrington Highway and adjacent to Waikele Stream. Irrigation and natural springs within the gardens form the principal flow to the stream and are directed through a single 4-foot-diameter culvert to Kapakahi Stream immediately above Farrington Highway. At times of extreme floods in Waikele Stream, flood waters may cover portions of the Waipahu Cultural Garden Park and exit through Kapakahi. The central portion of the watershed consists of downtown Waipahu business and urban areas with storm sewers flowing to Kapakahi. The lower portion of the drainage flows to West Loch along the eastern boarder of Pouhala Marsh. The Hawai'i Department of Health is working on an EPA-mandated total maximum daily load study of this watershed to better understand and control pollutant loadings to the stream and Pearl Harbor.

The site was visited on 3-23-09 at 9:20 a.m. under clear skies as documented in the following photographs. The site was revisited on 7-5-09. The elevation at this site is low but above the reach of the tide. All elevation measurements were made to one of two common points marked on the bridge railings, and the elevations of these points were determined by a certified surveyor. The elevation of the OHWM is 0.14 foot above the stream bed immediately downstream of the bridge, as judged from stains on the concrete sidewalls. Because the straight stream channel below the bridge is maintained as a flood-control channel, there were no shelving marks on the banks of the channel. The slope of the stream bed to the next downstream bridge was estimated to be approximately 0.5 percent based upon the small riffles in the shallow flow.

Potential Impacts

The Project would completely clear-span Site 9 (see Appendix B), and impacts are not anticipated to occur below the OHWM. However, impacts, such as shading of the stream channel, may occur as a result of the Project. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

Aerial Site Map



Site Photographs

Photo 9A: Upstream right embankment



Photo 9B: Upstream left embankment



Photo 9C: Downstream left embankment



Photo 9D: Downstream right embankment



Photo 9E: Upstream view of lower bridge



Photo 9F: Upstream riparian zone at left embankment



Photo 9G: Cross-sectional area of downstream



Photo 9H: Upstream view under bridge



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Honolulu Rapid Transit/ Site 9. Kapakahi Stream	Date:	3/23/2009; 7/5/2009 (EG)
Applicant/Owner:	City and County of Honolulu	County:	Honolulu
Investigator:	E. Guinther, T. Koehler, T. Mulitauaoepe	State:	HI
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID:	
Is Area a Potential Problem Area? (if needed, explain on reverse)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID:	DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Bacopa monieri</i>	HERB	OBL	8		
2 <i>Echinochloa crus-galli</i>	HERB	FACW	9		
3 <i>Cyperus difformis</i>	HERB	OBL	10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Mud banks and bars exposed as stream level drops into dry season now (7/5) covered by various wetland plants (only dominants indicated above) where previously (3/23) barren and sediment submerged.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks)	Wetland Hydrology Indicators:	<i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands	<i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
<input type="checkbox"/> Stream, Lake, or Tide Gauge			
<input checked="" type="checkbox"/> Aerial Photographs			
<input type="checkbox"/> Other			
<input type="checkbox"/> No recorded data available	Field Observations:		
Depth of Surface Water: 4-5 (in.) Depth to Free Water in Pit: _____ (in.) Depth to Saturated Soil: _____ (in.)			
Remarks: The elevation of the ordinary high water mark, as judged from stains on the concrete sidewall, was approximately 0.5-feet above the water level on 3/23.			

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____	<i>Circle</i>			
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: No soil pit observation in stream channel. This is a stream in a modified channel with silty sediment deposits. Emergent herbaceous vegetation develops as the flow decreases into the dry season, and is then mostly removed by wet season freshets.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: Form used to document non-wetland waters' characteristics at this location.			

Form Content Approved by HQUSACE 3/92

Site 18—Kalauao Stream

Site Summary

Site 18—Kalauao Stream is located along Kamehameha Highway at the bridge over Kalauao Stream in 'Aiea. At Site 18, the Kalauao Stream is confined within a man-made channel of natural materials and has a natural bed. The approximate location of Site 18 is 21°22'50.600"N latitude and 157°56'25.000"W longitude (see the following Site 18 maps).

During the on-site field survey, no wetlands were observed at this location. However, the Kalauao Stream is present at this location and an estuary wetlands (WCP 2007) was observed approximately 300 feet downstream of Site 18. The existing conditions of the Kalauao Stream were documented and recorded in the routine wetland determination data form (see the following Site 18 form). The Kalauao Stream is likely non-tidal at this location, although this RPW does convey flows directly to the East Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 2,111-acre Kalauao watershed consists of a single long narrow valley that extends to the top of the Ko'olau Mountain Range but receives the majority of its permanent flow from springs similar to those feeding the adjacent Kalauao Canal (Site 17).

The site was visited on 3-24-09 at 11:00 a.m. under clear skies as documented in the following photographs. The stream appears to rest in a more-or-less natural-looking bed with the alignment probably modified and controlled by a variety of individual walls, revetments, and vegetated banks. The distance across the bottom of the active stream bed is about 18 feet; 40 feet wide measured across the top of bank. The channel depth was approximately 8 feet. At the time of inspection, the water depth in the stream was a maximum of 1 foot in pools, with shallow riffle-pool complexes upstream and a long pool downstream of the bridge.

The water elevation of the stream was referenced to a marked point on the bridge railing, and the elevation of that point was determined by a certified surveyor. The OHWM of 1.84 feet above MSL under the bridge (downstream) and 1.64 feet above MSL upstream is 1.52 to 1.53 feet above the bed at the two locations. These levels were established by staking on the concrete upstream of the highway and bank incision downstream of the highway. The USGS maintains a gage (No. 16224500) below the highway which has a long-term flow average of 2.93 cfs.

The water in the stream is clear with minimal fine sediments or trash and displayed a salinity reading of zero. Fish life in the stream was not quantified but appeared to be both abundant and diverse. No wetland plant species were noted along the stream. Vegetation on the banks appears to be controlled through herbicide application and physical removal, with urban trees limited to the top of the bank, generally behind fences.

Potential Impacts

The Project would completely clear-span Site 18 (See Appendix B) and impacts to waters of the U.S. are not anticipated. However, impacts, such as shading of the channel, may occur as a result of the Project. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 18A: Downstream view of left bank



Photo 18B: Downstream at left embankment



Photo 18C: Upstream right embankment (note brown grass along bank)



Photo 18D: Upstream left embankment



Photo 18E: Downstream view through right channel opening



Photo 18F: Downstream view at left channel under bridge



Photo 18G: Right embankment view under Kamehameha Highway



Photo 18H: Upstream view under bridge



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Honolulu Rapid Transit/ Site 18. Kaluaao Stream	Date:	3/24/2009
Applicant/Owner:	City and County of Honolulu	County:	Honolulu
Investigator:	R. Bourke, T. Koehler	State:	HI
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Transect ID:
Is Area a Potential Problem Area? (if needed, explain on reverse)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Plot ID:
			DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks: Minimal vegetation (sprayed with herbicide) present along stream banks.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	<i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: This is a stream with steep, modified banks. USGS gage No. 16224500		

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: No soil sample was obtained. Loose material is either fill along banks or coarse sediment bars.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters' characteristics for the this location.					

Form Content Approved by HQUSACE 3/92

Site 28—Kalihi Stream

Site Summary

Site 28—Kalihi Stream is located on Kamehameha Highway at the highway bridge over Kalihi Stream. Kamehameha Highway merges into Dillingham Boulevard in this area just east of Middle Street. The spanned reach of Kalihi Stream is a tidal estuary located about 1,000 feet up from the mouth on Ke'ehi Lagoon. The approximate location of Site 28 is 21°19'58.384"N latitude and 157°53'16.944"W longitude (see the following Site 28 maps).

During the on-site field surveys, Kalihi Stream was observed at Site 28 and the existing conditions were documented and recorded in the routine determination data form (see the following Site 28 form). Based on the best available information and the on-site field surveys, Kalihi Stream is a RPW discharging flows into Ke'ehi Lagoon, a TNW and embayment of the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 3,976-acre Kalihi watershed encompasses significant lands in Kalihi Valley up to the top of the Ko'olau Mountain Range and also incorporates flows from lower urban and business districts in Honolulu. From the proposed right-of-way crossing just below Dillingham Boulevard, the stream flows only an additional few hundred feet beneath North Nimitz Highway into the Ke'ehi Lagoon section of Honolulu Harbor.

The site was visited on 2-9-09 at 12:00 noon and 2-11-09 at 7:00 a.m. under clear no-rainfall conditions as documented in the following photographs. Kalihi Stream flows in a slightly sinuous natural bed within a modified channel; individual property owners provide flood protection in the form of concrete walls set back 10 to 20 feet from the bank. Land use surrounding the proposed right-of-way across the stream is business and light industrial. Both banks of the stream above the Dillingham bridge consist of eroded dirt and rock cobble with mixed grasses, weeds, and mangrove down to the active channel. Some mangrove trees upstream are generally larger (to 10 feet high) than those seen downstream, but this appears to be a function of maintenance cutting and clearing. Upstream of the bridge, the mangroves appear to be limited to the rocky side slopes of the channel. Downstream, particularly just above the Nimitz Highway bridge on the left bank, there has been significant deposition of a mud bank where once a mature mangal stood.

Upstream of the Dillingham bridge, the channel has a top of bank width of about 75 feet between eroded dirt banks. The 25-foot-wide wetted width of the stream is a mixture of fine dark silty sand and gravel with a rock riffle about 100 feet above the bridge. Mangroves decrease in abundance above the riffle, so this likely represents the effective extent of the reach of the high tide. Downstream of the Dillingham Street bridge, the channel increases in width to almost 100 feet at the top bank and 87 feet across the wetted surface.

The USGS has two long-term gage stations on the Kalihi Stream, the closest of which (No. 16229300) is just above the H-1 Freeway at an elevation of 70 feet, about one stream

mile above the project site and receiving flow from about 3,315 acres of the watershed. The 42-year record for this site (1962–2004) shows two occasions when peak flows exceeded 7,000 cfs and indicates that peak flows exceeding 2,500 cfs occur about every other year. A daily average flow of 300 cfs is achieved about every 1.5 years, making this the “channel forming” flow for this reach of the stream. The average annual daily flow has varied from 2.7 to 21.3 cfs with a mean of 9.8 cfs.

The omnipresent schools of tilapia were joined by occasional mullet (*Mugil sp*), lai (*Scoberoides lysan*), and a single barracuda (*Syphraena sp*) attesting to the estuarine character of this lower reach.

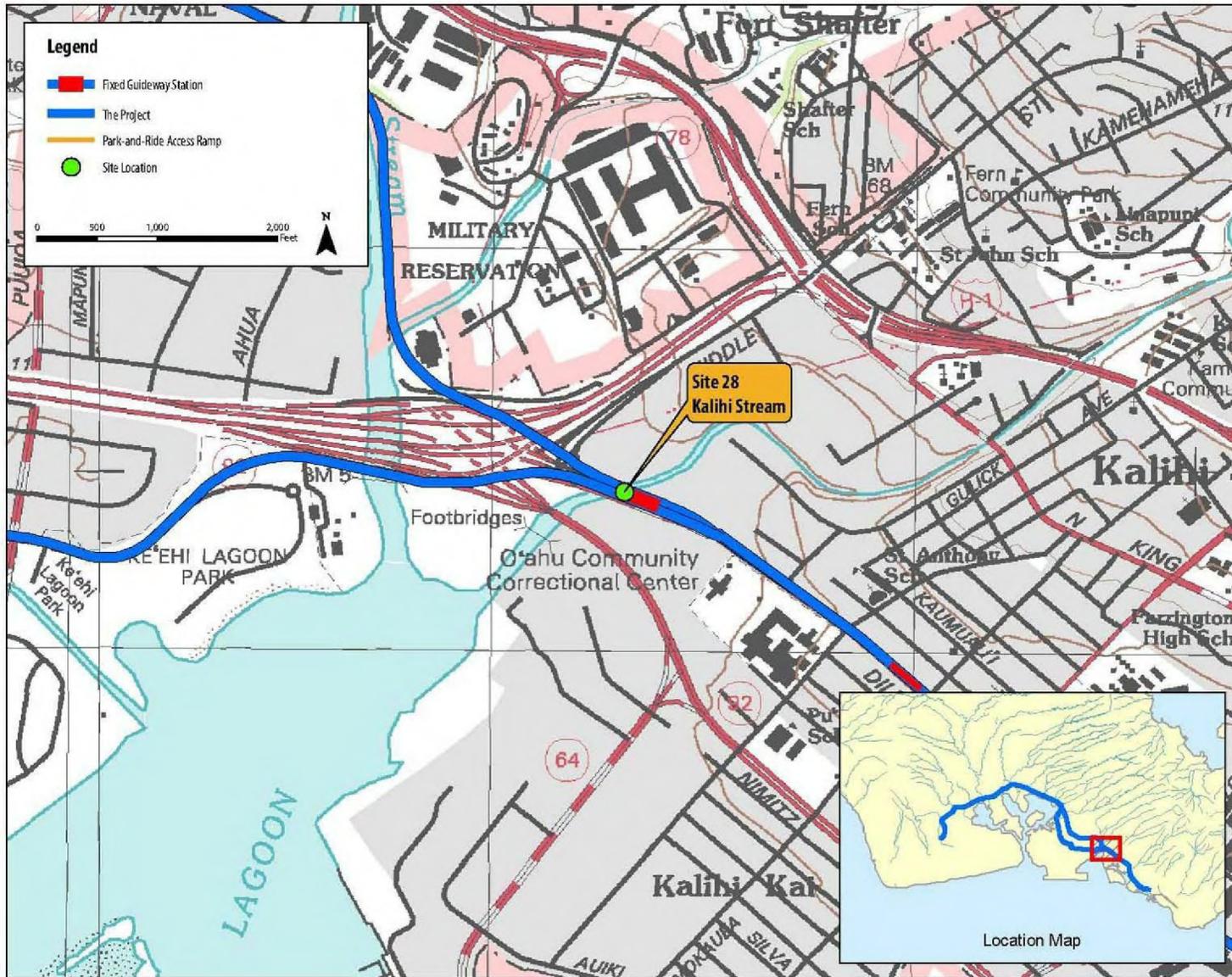
In addition to the mangrove, Indian fleabane (*Pluchea indica*) and pickleweed (*Batis maritima*) were also seen at the site. All of these are growing almost exclusively on the upper dry portions of the eroded stream banks.

The water had a refractometer-measured salinity of 2 ppt; however, it is likely that this salinity increases significantly on the high tide. The water was clear enough to see the bottom at a 1-foot depth but not 2 feet. The average depth of the channel beneath the makai edge of the Dillingham bridge was 1 foot, with a maximum of 2.2 feet at a tide elevation of 0.55 foot above MSL. The OHWM, at this location, was observed at 2.28 feet above the streambed, which corresponds to the higher high-tide elevation at this site of 1.25 feet MSL. The OHWM was determined by various indicators and resources that include clear line impressed (stain) on bridge pier pilings, bank sidewalls upstream and downstream of bridge, change in the slope of the banks above the OHWM, absence of salt tolerant plants below the OHWM, and tide gage data. Tide gage data establish an OHWM corresponding to MHHW at 2.56 feet above the stream bed (1.08 feet above MSL).

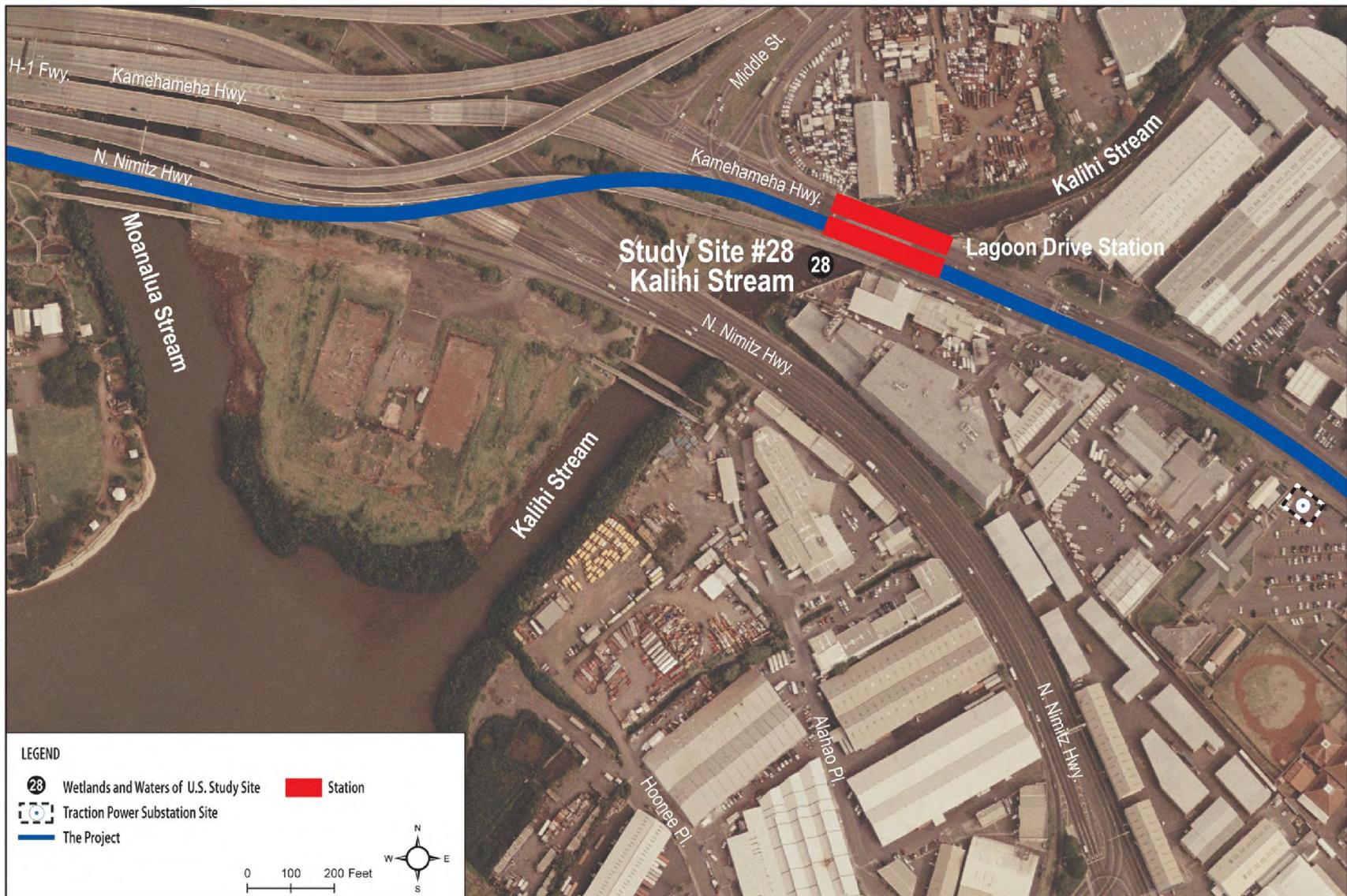
Potential Impacts

The Project would completely clear-span Kalihi Stream at Site 28 and impacts are not anticipated to occur below the OHWM. However, impacts, such as shading of the stream channel, may occur as a result of the Project. If changes in the design occur that may result in additional potential impacts to waters of the U.S., they will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 28A: Upstream right embankment at low tide



Photo 28B: Upstream left embankment (note mangroves along stream bank)



Photo 28C: Downstream left embankment (note mangroves cut along bank)



Photo 28D: Downstream right embankment



Photo 28E: Downstream view of makai bridge



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 28.Kalihi Stream</u>	Date: <u>2/9/09</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u>Pluchea carolinensis</u>	SHRUB	FAC	8		
2 <u>Pluchea indica</u>	SHRUB	FAC	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Scattered mangrove shrubs present.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>28</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>USGS Gage No. 16229300 and Honolulu Harbor Tide Gage. This is an estuary (tidal) channel.</u>	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Circle Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: <u>No soil sample examined.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: <u>Form used to document non-wetland waters' characteristics at this location.</u>					

Form Content Approved by HQUSACE 3/92

Site 31—Pānakauahi Gulch

Site Summary

Site 31—Pānakauahi Gulch is located at the lower end of the H-2 Freeway where the Interstate crosses over Pānakauahi Gulch just north of its terminus at the H-1 Freeway. The gulch is an intermittently flowing stream that is a tributary to the perennially flowing Waiawa Stream (see Site 12) that discharges into Middle Loch, Pearl Harbor, a TNW. The approximate location of Site 31 is 21°24'04.300"N latitude and 157°59'18"W longitude (see the following Site 31 maps).

During the on-site field surveys, the Pānakauahi Stream was observed and the existing conditions were documented and recorded in the routine wetland determination data form (see the following Site 31 form). Based on the best available information and the on-site field surveys, the Pānakauahi Stream is a non-RPW that flows into the perennial Waiawa Stream (RPW), which discharges into Middle Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

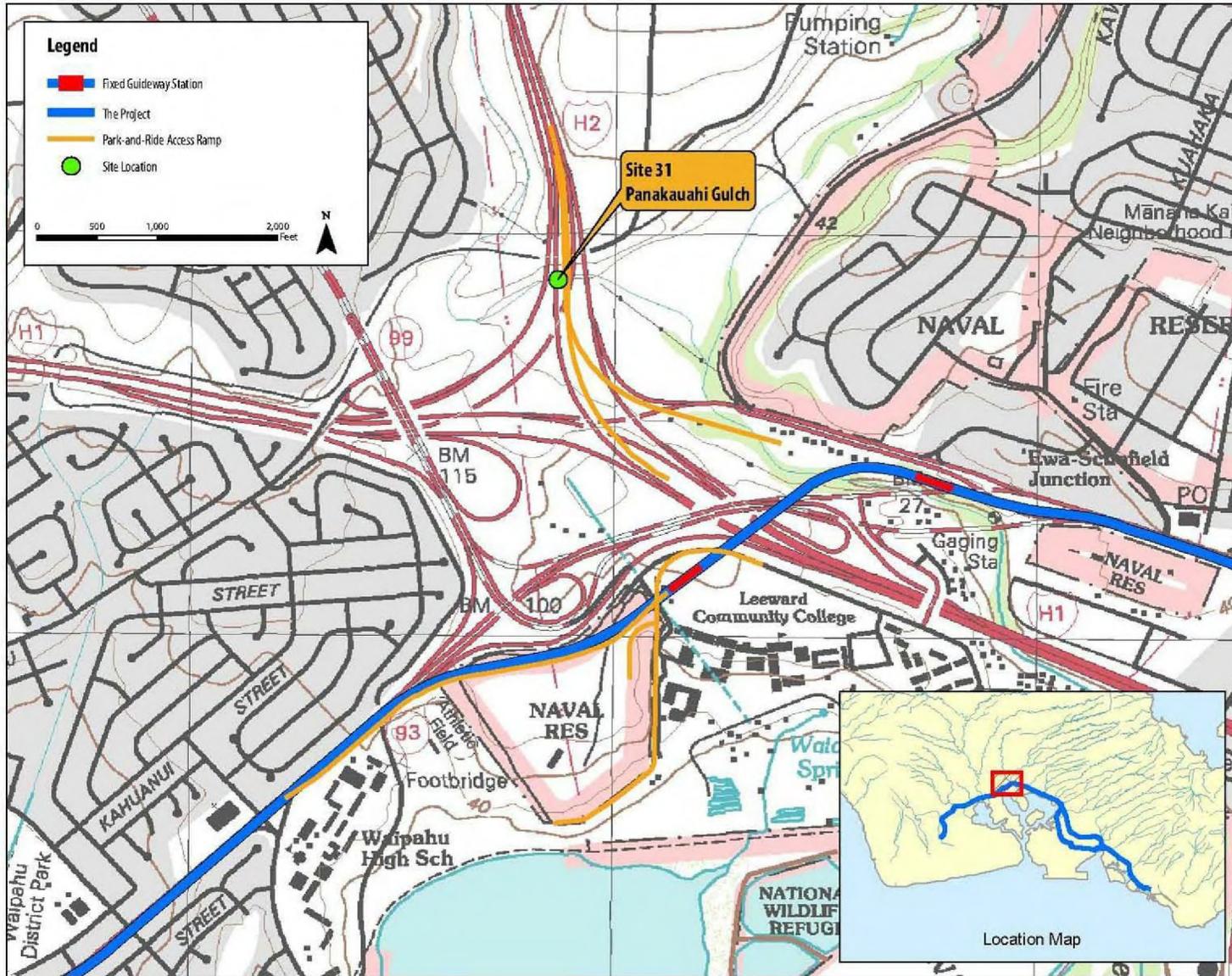
The Waiawa watershed encompasses 17,400 acres, of which only about 3,400 acres lies within the Pānakauahi sub-basin. Whereas the Waiawa watershed extends into large valleys up to the top of the Ko'olau Mountain Range, the area of the Pānakauahi Gulch extends only partially up the mountain range and, therefore, does not receive a consistent rainfall. However, when rains do fall on the leeward side of the range, the Pānakauahi sub-basin can receive significant rainfall and, therefore, tends to exhibit very flashy flow events.

The site was visited on 5-8-09 at 12:00 p.m. under clear no-rainfall conditions as documented in the following photographs. There are presently four separate highway bridges spanning the gulch at this site, all supported by tall cylindrical concrete pylons situated well back from the stream bed up on the riparian slope. The stream bed consists of a 2- to 4-foot-wide dry dirt bed with river stone deposits visible on the lower banks. The vegetative understory consists primarily of tall grasses with an overstory of dry-land forest dominated by large Keawe trees. No wetland plants were noted. There was no flow at the site nor evidence of recent flow events making it highly doubtful that this stream experiences frequent flow events. The OHWM was observed at approximately 2.5 feet from the streambed (elevation 34.5 feet MSL), as indicated by a clear natural line impressed on the bank in the exposed dirt, shelving on steep banks 300 feet downstream of proposed rail crossing, changes in the character of soil with increased organic matter above the OHWM, and destruction of terrestrial vegetation.

Potential Impacts

The Project would completely clear-span Pānakauahi Gulch at this location and impacts are not anticipated to occur below the OHWM. However, impacts, such as shading of the stream channel, may occur as a result of the Project. If changes in the design occur that may result in additional potential impacts to waters of the U.S., they be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 31A: Dirt stream bed as seen from Cane-Haul Road beneath the H-2 Freeway overpass



Photo 31B: View between existing freeway pilings showing general overgrown nature of site



Photo 31C: View between existing freeway pilings showing general overgrown nature of site



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 31.Panakauahi Stream	Date: 5/8/09
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: Hawaii
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Panicum maximum</i>	HERB	FACU	8		
2 <i>Leucaena leucocephala</i>	TREE	UPL	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: 0 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Remarks: This is an intermittent stream (Non-RPW).

SOILS

Map Unit Name (Series and Phase): _____ Taxonomy (Subgroup): _____	Drainage Class: _____ Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil sample taken.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Form used to document non-wetland waters' characteristics at this location.	

Form Content Approved by HQUSACE 3/92

Category IVA—Freshwater Wetlands Proximate to the Project

Site 15—Waiau Springs and Wetland

Site Summary

Site 15—Waiau Springs and Wetland is located along Kamehameha Highway at the 400 block, east of the Hawaiian Electric Company (Waiau Generating Station). Site 15 consists of Waiau Springs and a wetland system that is located on the north side of Kamehameha Highway. Waiau Springs serves as a water source for the wetland and also acts as a drainage outlet as it conveys water flow south and under, via culverts, Kamehameha Highway. Waiau Springs continues in a modified channel to the shore of East Loch, Pearl Harbor. The approximate location of Site 15 is 21°23'22.226"N latitude and 157°57'30.757"W longitude (see the following Site 15 maps). The elevation of the stream invert below the highway bridge is approximately 6 feet.

As noted, Waiau Springs and a wetland system were identified during the on-site field surveys at Site 15. The existing conditions of Waiau Springs and the wetland system were documented and recorded in the routine wetland determination data forms (see the following Site 15 form). The wetland (ACOE 1994; WCP 2007) on the mauka (north) side of Kamehameha Highway is influenced by various water sources, including Waiau Springs. Waiau Springs is a perennial (RPW) stream that discharges water flows directly into East Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 7,797-acre Waimalu watershed contains Waimalu Stream, Waiau Stream, Waimano Channel, and Punanani Stream, as well as a number of small springs of which Waiau Springs is one.

The 2.8-acre property (Site 15) is owned by the Hawaiian Electric Company. Site 15 was visited on 3-23-09 at 1:30 p.m. and again during the morning of 4-16-09, both under clear no-rainfall conditions as documented in the following photographs. The purpose of the first site visit was to document the stream flow under the right-of-way passing down the center of Farrington Highway. The second visit was made to conduct a wetland delineation. This included four transects that were distributed along the east side of the wetland where the land has a low slope into the wetland. At transects A, B, and D, two soil pits were positioned perpendicular to the presumed wetland boundary based upon vegetation type. At transect C the presumed wetland boundary was steep and the wetland vegetation was a thick stand of California grass without visible surface water. Therefore, a shallow pit was dug in the grass to confirm the wetland hydrology. The routine wetland determination data

forms further detail the wetland delineation activity. A visual observation of the wetland was also made on 7-06-09.

Additional on-site observations noted a box culvert supplying water to the Waiau wetland. The box culvert was constructed primarily to serve as the discharge point for the State of Hawai'i Department of Transportation (HDOT) drainage system, which serves about 38 acres of the H-1 Freeway, Moanalua Road, and Waimalu interchange. The data review revealed that the USGS monitored combined flow from this and other downstream sources near the harbor outfall (gage No. 16219000, elevation 2 feet ASL) daily from 1939 through 1967 with an average daily flow rate of about 16 cfs. More recent measurements show a flow of only 3.1 to 3.6 cfs at this gage site. Residents with homes adjacent to the pond relate that during periods of heavy rainfall, the highway drainage is sufficient to raise the level of the water in the wetland by as much as 4 feet.

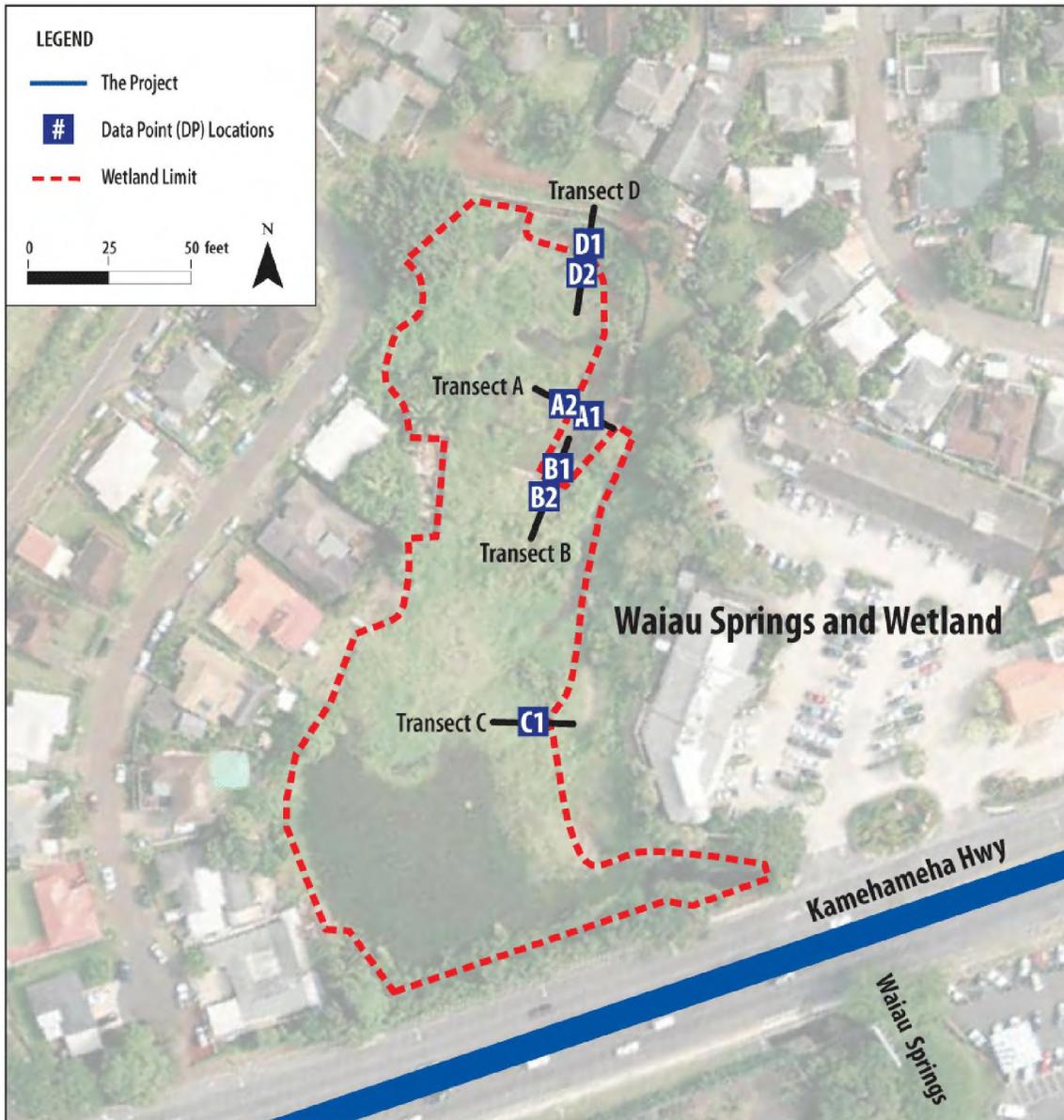
The vegetation record was rechecked on July 6, 2009. Along the inner side of the concrete box culvert, a 20-foot-wide deposit of red soil covers the highly organic subsurface layers. It is difficult to tell if this soil was placed here to act as back-fill support for the box culvert or if it was placed here for other reasons, but it forms a layer of non-wetland soil overlaying wetland soil. Beyond the end of the concrete box culvert, both banks consist of built-up soil containing inclusions, such as plastics and metals. According to longtime residents, the pond used to have a more open water with depths up to 4 feet where there is now dry land. A number of neighbors actively farm accessible parts of the wetland. A majority of the inner area of the wetland is covered with California Grass (*Urochloa mutica*, syn. *Brachiaria mutica*). Towards Kamehameha Highway, the surface of the water is covered by floating water hyacinth (*Eichhornia crassipes*) and Ung-choi (*Impomoea aquatica*). In the more inland part of the wetland, shaded by a large tree, the open water is covered by azolla fern (*Azolla filiculoides*).

A stream forms on the south side of the wetland as water exits the wetland through a concrete-lined channel flowing south and under Kamehameha Highway via a triple barrel box culvert (diameter of each barrel is 5 feet by 8 feet). The 110-foot-long culvert pipes discharge into a control box that empties over a 10.5-foot-wide weir into a drainage channel (Waiau Springs), which discharges some 600 feet downstream into Middle Loch. The channel has an overall depth of almost 10 feet to the top of the bank. The soil banks slope steeply away from the channel but are stabilized by the roots of numerous large trees on and above the banks. On the day of the survey, the channel had a wetted width of 40 feet, an average depth of 1.2 feet, a salinity of 0.0, and was flowing slowly towards Pearl Harbor at an estimated discharge of less than 5 cfs. The OHWM of Waiau Springs was determined to be approximately 3 feet above the streambed, as indicated by staining, bank scouring, and matted vegetation in the downstream area.

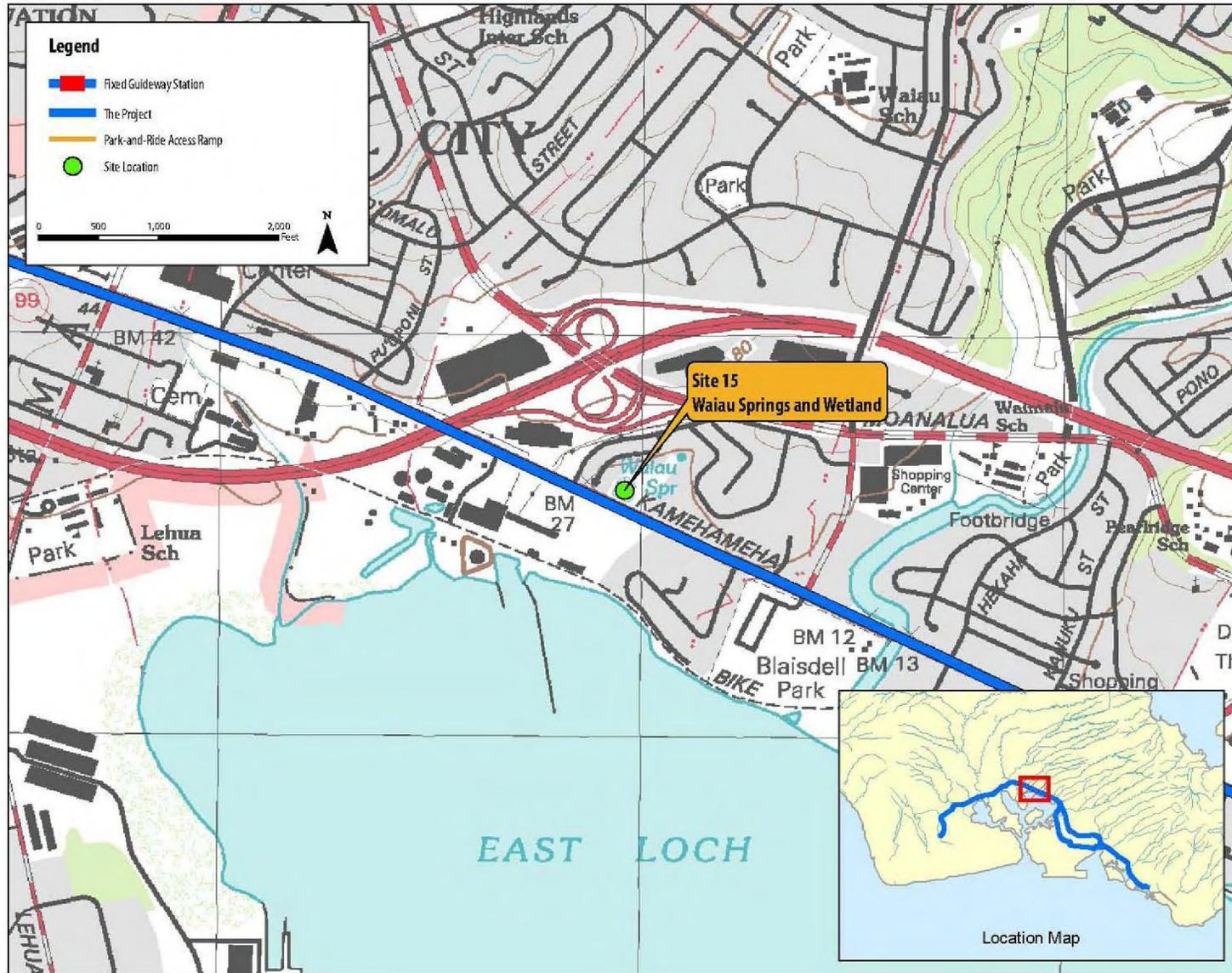
In addition to tilapia, the stream and wetland above the highway contained at least four additional fish species (mollies, guppies, koi, and a cichlid) noted by casual observation. No waterfowl were noted during either field trip, but the habitat might be suitable feeding and nesting habitat for Hawaiian Coot and Gallinule.

Potential Impacts

The Project would clear-span Waiiau Springs and would not encroach upon the wetland boundary located to the north of Kamehameha Highway. Therefore, no impacts are anticipated at Site 15 as the wetland is beyond the Project limits and Waiiau Springs flows within a culvert under Kamehameha Highway and would not be disturbed.



USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 15A: View mauka of Kamehameha Highway



Photo 15B: Culverts draining pond under highway



Photo 15C: Limited open water near drain culverts



Photo 15D: Edge of wetland against Kamehameha Highway slope



Photo 15E: Land owner actively gardens fenced off area of wetland



Photo 15F: Taro and other obligate wetland plants dominate the wetland



Photo 15G: Panorama of upper portion of wetland showing inflow box culvert and “dry” gardened area of wetland



Photo 15H: Water flowing from 10-foot-wide weir



Photo 15I: Kamehameha Highway above stream



Photo 15J: Box flow control structure below stream



Photo 15K: Downstream view



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 15. Waiiau Spring (Stream)	Date: 3/23/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Cyperus alternifolius</i>	HERB	FACW	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Plants occurring in stream, but not abundant.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: _____ (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: This is a stream with abrupt banks (concrete-lined for a short distance downstream of bridge). Water source for this stream is the spring-fed wetland (see Data Forms for transects A, B, C, and D at Site 15).	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Circle Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil sample examined. Study area is a stream with the steep banks (concrete in places).					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: Form used to document non-wetland waters characteristic's in this location.					

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 15. Waiiau Spring	Date: 3/23/2009, 4/16/09, 7/6/2009
Applicant/Owner: Hawaiian Electric Company	County: Honolulu
Investigator: R. Bourke, T. Mulitauaoepele, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID:
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: A
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Chloris barbata</i> = <i>C. inflata</i>	HERB	FACU	8		
2 <i>Ageratum conyzoides</i>	HERB	FAC	9		
3 <i>Malvastrum coromandelianum</i>	HERB	FACU	10		
4 <i>Cyperus rotundus</i>	HERB	FACU	11		
5 <i>Chamaesyce hypericifolia</i> = <i>Euphorbia hypericifolia</i>	HERB	FACU	12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 20%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: 0 (In.) Depth to Free Water in Pit: > 18 (In.) Depth to Saturated Soil: > 18 (In.)	
Remarks: No water at 18".	

SOILS

Map Unit Name (Series and Phase): Tropaquepts	Drainage Class: Poorly Drained				
Taxonomy (Subgroup): Typic Tropaquepts	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-3	litter				grass roots & litter
3-10	A	7.5YR 4/3			silty clay loam
10-18	B	7.5YR 2.5/3			
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: Gradual slope from edge of concrete channel towards wetland appears to be fill over darker native soil. The soils adjacent to the spring/wetland area do not map to the map unit. 21.389728 N Latitude, 157.957584 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Remarks: Upland soil sample location.	

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 15. Waiiau Spring</u>		Date: <u>3/23/2009, 4/16//2009, 7/6/2009</u>
Applicant/Owner: <u>Hawaiian Electric Company</u>		County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Mulitauaopele, E. Guinther</u>		State: <u>HI</u>
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>A</u>
Is Area a Potential Problem Area? <i>(if needed, explain on reverse)</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 2</u>

VEGETATION					
Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Chloris barbata = C. infata</i>	HERB	FACU			
2 <i>Paspalum conjugatum</i>	HERB	FAC+			
3 <i>Conyza bonariensis</i>	HERB	NL			
4 <i>Eclipta alba</i>	HERB	FACW			
5					
6					
7					

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50%

Remarks: Planted bean vines (*Phaseolus vilgaris*) trailing across site.

HYDROLOGY	
<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>0</u> (In.) Depth to Free Water in Pit: <u>12</u> (In.) Depth to Saturated Soil: <u>About 9</u> (In.)	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands Secondary Indicators (2 or more required): <input checked="" type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>Pit on a landscaped slope.</u>	

SOILS					
Map Unit Name (Series and Phase): <u>Tropaquepts (TR)</u>			Drainage Class: <u>Poorly drained</u>		
Taxonomy (Subgroup): <u>Typic Tropaquepts</u>			Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2	organic				roots & litter
2-10	A	7.5YR 4/3			silty clay-loam
10-14	B	10YR 2/2		none	clay
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>"Red dirt" layer thins to 8" over dark saturated soil. Surface soil does not map to map unit. 21.389858 N Latitude, 157.957658 W Longitude</u>					

WETLAND DETERMINATION	
Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hydric Soils Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Remarks: <u>Grass mowed at site of pit (3/23/09), but wetland plants and surface water within 10 feet of pit; wetland soils buried by shallow fill at this point.</u>	

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 15. Waiiau Spring</u>		Date: <u>3/23/2009, 7/6/2009</u>
Applicant/Owner: <u>Hawaiian Electric Company</u>		County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Mulitauaopele, E. Guinther</u>		State: <u>HI</u>
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>B</u>
Is Area a Potential Problem Area? (if needed, explain on reverse)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 1</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Malvastrum coromandelianum</i>	HERB	FACU			
2 <i>Eclipta alba</i>	HERB	FACW			
3 <i>Chloris inflata</i>	HERB	FACU			
4 <i>Bidens pilosa</i>	HERB	NI			
5 <i>Conyza bonariensis</i>	HERB	NL			
6					
7					

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 20%

Remarks: _____

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>0</u> (In.) Depth to Free Water in Pit: <u>> 20</u> (In.) Depth to Saturated Soil: <u>> 12</u> (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: _____	

SOILS

Map Unit Name (Series and Phase): <u>Tropaquepts (TR)</u>		Drainage Class: <u>Poorly drained</u>			
Taxonomy (Subgroup): <u>Typic Tropaquepts</u>		Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2	O	n/a			turf
2-20	A	5YR 3/3			silty loam
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: <u>1st attempt at pit uncovered rock and gravel (fill). 21.389781 N Latitude, 157.957819 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Remarks: <u>This appears to be the end of a filled area extending as a berm beyond the concrete channel. Evidence of fill.</u>			

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 15. Waiiau Spring</u>		Date: <u>3/23/2009, 7/6/2009</u>
Applicant/Owner: <u>Hawaiian Electric Company</u>		County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Mulitauaopele, E. Guinther</u>		State: <u>HI</u>
Do Normal Circumstances exist on the site?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>B</u>
Is Area a Potential Problem Area? <i>(if needed, explain on reverse)</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 2</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Sorghum halapense</i>	HERB	FACU-	8		
2 <i>Bothriochloa pertusa</i>	HERB	NL	9		
3 <i>Ipomoea trioba</i>	HERB	NL	10		
4 <i>Paspalum urvillei</i>	HERB	FAC	11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 25%

Remarks: Planted bean vines (*Phaseolus vilgaris*) trailing across site.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>n/a</u> (In.) Depth to Free Water in Pit: <u>14</u> (In.) Depth to Saturated Soil: <u>12</u> (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: _____	

SOILS

Map Unit Name (Series and Phase): <u>Tropaquepts (TR)</u>		Drainage Class: _____			
Taxonomy (Subgroup): <u>Typic Tropaquepts</u>		Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2	O	n/a			turf, litter
2-12	A	5YR 3/3			silty loam
>12		7.5YR 2.5/1			silty clay
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input checked="" type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>Saturated soils below 1 ft. Soil type also changes at this horizon suggesting top soil was imported. 21.389717 N Latitude, 157.95794 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Hydric Soils Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: <u>Open water on surface ~ 15 ft. away. Soil character changes at about 1 ft. suggesting pit site was filled over wetland soil.</u>			

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 15. Waiau Spring</u>	Date: <u>3/23/2009, 7/6/2009</u>
Applicant/Owner: <u>Hawaiian Electric Company</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Mulitauaoepele, E. Guinther</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>C</u>
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 1</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u>Brachiaria mutica</u>	<u>HERB</u>	<u>FACW</u>	<u>8</u>		
2			<u>9</u>		
3			<u>10</u>		
4			<u>11</u>		
5			<u>12</u>		
6			<u>13</u>		
7			<u>14</u>		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Saturated mat of California Grass.

HYDROLOGY

<input type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>4</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: _____	

SOILS

Map Unit Name (Series and Phase): <u>Waipahu, Tropaquepts</u>	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): <u>TR</u>	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
<u>0-4</u>	<u>O</u>	<u>n/a</u>			<u>Litter</u>
<u>4+</u>	<u>O</u>	<u>Black</u>			<u>Peat</u>
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input checked="" type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input checked="" type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input checked="" type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>No attempt to reach soils below mat. 21.389554 N Latitude, 157.95812 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Hydric Soils Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: _____		

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 15. Waiiau Spring</u>		Date: <u>3/23/2009, 7/6/2009</u>
Applicant/Owner: <u>Hawaiian Electric Company</u>		County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Mulitauaopele, E. Guinther</u>		State: <u>HI</u>
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>D</u>
Is Area a Potential Problem Area? (if needed, explain on reverse)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 1</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Eclipta alba</i>	HERB	FACW	8		
2 <i>Cyperus polystachyos</i>	HERB	FAC	9		
3 <i>Chamaecybe hirta = Euphorbia hirta</i>	HERB	FACU	10		
4 <i>Crotalaria incana</i>	HERB	UPL	11		
5 <i>Ipomoea obscura</i>	HERB	UPL	12		
6 <i>Sida spinosa</i>	HERB	NI	13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 33%

Remarks: _____

HYDROLOGY

<input type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input checked="" type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>> 18"</u> (In.) Depth to Free Water in Pit: <u>> 18"</u> (In.) Depth to Saturated Soil: <u>> 18"</u> (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: _____	

SOILS

Map Unit Name (Series and Phase): <u>Tropaquepts (TR)</u>		Drainage Class: _____ <i>Circle</i>			
Taxonomy (Subgroup): _____		Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Profile Description:					
Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2	O	n/a			turf
2-14	A	5YR 4/3			silty loam
14+		7.5YR 2.5/3			silty clay
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>Saturated soils below 1 ft. Soil type also changes at this horizon suggesting top soil was imported. 21.390004 N Latitude, 157.957343 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Remarks: _____			

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 15. Waiau Spring</u>	Date: <u>3/23/2009, 7/6/2009</u>
Applicant/Owner: <u>Hawaiian Electric Company</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Mulitauaoepele, E. Guinther</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>D</u>
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 2</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Cyperus polystachyos</i>	HERB	FAC	8		
2 <i>Ludwigia octovalvis</i>	HERB	OBL	9		
3 <i>Commelina diffusa</i>	HERB	FACW	10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: _____

HYDROLOGY

<input type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>16</u> (in.) Depth to Free Water in Pit: <u>16</u> (in.) Depth to Saturated Soil: <u>12</u> (in.)	Wetland Hydrology Indicators: <table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> Primary Indicators: <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands </td> <td style="width: 50%; vertical-align: top;"> Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks) </td> </tr> </table>	Primary Indicators: <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Primary Indicators: <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)		
Remarks: _____			

SOILS

Map Unit Name (Series and Phase): <u>Waipahu, Tropaquepts</u>	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): <u>TR</u>	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-1	O	n/a			turf
1-12	A	5 YR 4/3			silty loam
12+		5YR 2.5/1			silty clay
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>21.389899 N Latitude, 157.957518 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Hydric Soils Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: _____		

Form Content Approved by HQUSACE 3/92

Site 17—Kalauao Springs

Site Summary

Site 17—Kalauao Springs is located along Kamehameha Highway at the Kalauao Springs culvert crossing adjacent to Pearlridge Center. This concrete-lined drainage collects storm runoff from areas of Pearl City upslope and serves as the outlet for Kalauao Springs, which feeds the watercress farm that divides the two phases of Pearlridge Center (ACOE 1994; WCP 2007). The approximate location of Site 17 is 21°22'55.000"N latitude and 157°56'35.000"W longitude (see the following Site 17 maps).

During the on-site field surveys, Kalauao Springs, the watercress farm, and drainage canal for the watercress farm were observed at Site 17. The existing conditions were documented and recorded in the routine wetland determination data form (see the following Site 17 form). Based on the best available information and the on-site field surveys, the concrete-lined drainage is perennial flowing from Kalauao Springs and, therefore, a RPW that flows directly into East Loch, a TNW connected to the Pacific Ocean. The wetlands (farmed for watercress) in the depression north of the site are pond fields; however, the drainage canal conveys water flows directly to Kalauao Springs. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The watershed of Kalauao Springs drains limited lands of the surrounding Pearlridge Center and Pearl Country Club golf course above the H-1 Freeway (estimated <300 acres total) but receives the majority of its flow from Kalauao Springs feeding the adjacent watercress farm between the two branches of the Pearlridge Center on either side of the canal.

The site was visited on 3-24-09 at 10:00 a.m. under clear no-rainfall conditions as documented in the following photographs. The site was revisited on 7-06-09. The canal above Kamehameha Highway is trapezoidal with 1:1 sloping concrete sides and a natural bottom. The distance across the bottom of the canal is 35 feet, and the channel is 10 feet deep to the top of the side slopes with water approximately 1 foot deep at the time of inspection. Below the highway, the canal has grassed dirt banks averaging 15 feet apart between vertical concrete walls set back 10 to 15 feet from the stream edge. The large majority of the flow comes from drains in the sidewalls draining the adjacent approximately 10 acres of pond fields referred to as the "Watercress Farm." The OHWM of the drainage canal conveying water from the watercress farm is approximately 3 feet above the streambed, which encompasses the limits of the watercress farm.

The OHWM upstream of the highway bridge appears, as evidenced from staining on the concrete and bank incision below the highway at 2.0 feet above the concrete bed. On the downstream side of the structure, the OHWM is 3.46 feet above the bed. Makai of the bridge, the OHWM appears to be higher (an elevation of 3.47 feet above MSL) compared with upstream (an elevation of 2.09 feet above MSL), possibly due to backwater caused by

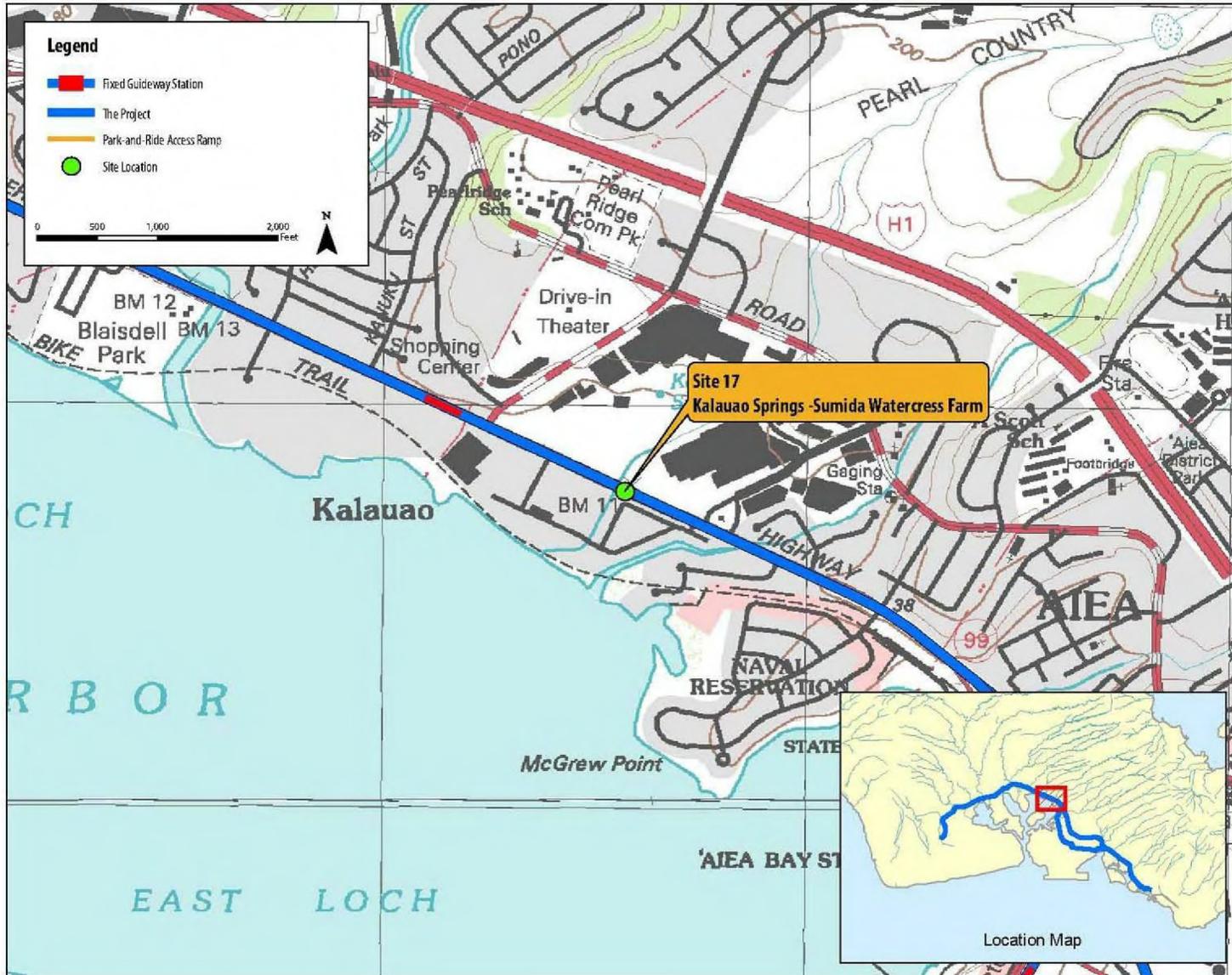
growth of mangrove in the channel. The USGS supports a gage (No. 16224000) downstream of the highway which has a long-term flow average greater than 2 cfs.

The water in the stream is clear and noticeably cool compared to other similar-sized streams in the area. Fish life in the stream was not quantified but appeared to be both abundant and diverse.

Potential Impacts

The Project would clear-span Kalauao Springs and would not encroach upon the OHWM of the drainage canal north of the highway (see Appendix B). Therefore, it is not anticipated that waters of the U.S. would be impacted by the Project. However, impacts, such as shading of the stream canal may occur at Site 17 from the Project. If design changes occur that may impact the identified waters of the U.S., these impacts will be disclosed in the Section 404/10 permit application and/or the Final EIS.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 17A: Watercress farmlands, mauka of Kamehameha Highway, drain into stream



Photo 17B: Watercress farmlands, mauka of Kamehameha Highway, drain into stream



Photo 17C: Upstream right embankment showing influent from farmlands



Photo 17D: Upstream left embankment



Photo 17E: Upstream view through bridges



Photo 17F: Downstream at left embankment



Photo 17G: Left embankment view under bridge



Photo 17H: Stream channel opening between bridges facing east



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 17. Kalauao Springs-Sumida Watercress Farms	Date: 3/24/2009, 7/6/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Digitaria</i> sp.	HERB	NL	8		
2 <i>Panicum maximum</i>	HERB	FACU	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: Cucurbits planted over area.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands
Field Observations: Depth of Surface Water: 0 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: Above bank of collection ditch for watercress fields.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0 - 10	A	2.5Y 5/3			
10 - 16		2.5Y 4/3			
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: Non-wetland (upland) data point; upland soil (likely to be fill land associate with adjacent Kamehameha Highway). 21.382621 N Latitude, 157.94402 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Remarks:					

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 17. Kalauao Springs-Sumida Watercress Farms Applicant/Owner: City and County of Honolulu Investigator: R. Bourke, T. Koehler	Date: 3/24/2009 County: Honolulu State: HI Community ID: _____ Transect ID: _____ Plot ID: DP#
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Cyperus alternifolius</i>	HERB	FACW	8		
2 <i>Nasturtium microphyllum</i>	HERB	OBL	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Plants occurring in stream, but not common around highway bridge.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 12 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: Primary Indicators: <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: This is a stream with abrupt banks (concrete-lined upstream of bridge). There are two water sources for the stream: 1) permanently-flowing spring water from the watercress farm flowing to a collection ditch that parallels Kamehameha Highway and 2) storm water flow (relatively non-permanent) from storm events carried by the concrete-lined channel.	

SOILS

Map Unit Name (Series and Phase): _____ Taxonomy (Subgroup): _____	Drainage Class: _____ Circle Field Observations Confirm Mapped Type? Yes No																														
Profile Description: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Depth (inches)</th> <th style="width: 15%;">Horizon</th> <th style="width: 15%;">Matrix Color (Munsell Moist)</th> <th style="width: 15%;">Redoximorphic Feature Colors (Munsell Moist)</th> <th style="width: 15%;">Redoximorphic Feature Abundance/ Size/Contrast</th> <th style="width: 20%;">Texture, Concretions, Structure, etc.</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.																								
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.																										
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)																															
Remarks: No soil sample examined. Study area is a stream with the steep banks.																															

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: Form used to document non-wetland waters characteristic's in this location.
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Site 25—Aolele Ditch (Airport)

Site Summary

Site 25—Aolele Ditch is located along Aolele Road, west of Lagoon Drive, adjacent to the Honolulu International Airport. Aolele Ditch is a man-made drainage feature serving the eastern end of the airfield and discharging into Ke'ehi Lagoon. Site 25 is located at approximately 21°19'57.146"N latitude and 157°54'21.769"W longitude (see the following Site 25 maps).

During the on-site field surveys, it was observed that a portion of the Aolele Ditch within the project area is subject to the ebb and flow of the tide, and accumulated sediment supports wetland species. Above this point, the ditch should only receive storm runoff flows (a non-RPW) from the land. However, several drains entering the channel have sufficient temporal flow so that wetland plants are supported in several locations. The tidal nature and presence of incipient wetlands indicate a likely connection to Ke'ehi Lagoon, a TNW and embayment of the Pacific Ocean. The existing site conditions were documented and recorded in the routine wetland determination data form (see the following Site 25 form).

Site Description

The Aolele Ditch drains the northeastern portion of the airport and commercial properties up to Nimitz Highway and flows to Ke'ehi Lagoon. This drain was created where uplands existed previously. The site was visited on 3-18-09 at 11:00 a.m. under clear skies as documented in the following photographs. Return visits were made on 7-5 and 7-6-09 to clarify certain aspects of the environment at the point where the Project is proposed to cross over the ditch.

The Aolele Ditch is a man-made trapezoidal flood control canal that more or less parallels Aolele Road flowing east under Lagoon Drive and into Ke'ehi Lagoon. The entire length of the open canal was surveyed from the bridge serving the HDOT maintenance yard to the box culverts under the H-1 Freeway onramps and Paiea Street, a distance of about 2,000 feet. Over the course of this distance, the channel changes from a concrete-lined canal subject to tidal flow to a channel cut into the limestone substratum and back to a concrete- and CRM-lined channel a short distance before the upper-end box culverts. The canal has a top-of-bank width of 45 feet and a bottom width of only 25 feet.

The water elevation of the channel was referenced to a marked point on the HDOT bridge railing, and the elevation of that point determined by a certified surveyor. The tide was low at the time of observation and had no impact on flow at this bridge. The OHWM, as judged from stains on the concrete sidewalls, was about 1.7 feet above the concrete channel bed at an elevation of about 1.27 feet above MSL. While the tide does come up the channel past this bridge to at least the lower end of vegetated sediment deposits, this apparent OHWM is higher than the 1.08-foot mean higher high-tide elevation at the site. Because of the low rainfall at the site and the proximity of the lagoon waters, using the OHWM of 1.08 feet above MSL is consistent with the other sites opening onto Ke'ehi Lagoon and nearby Honolulu Harbor.

At the time of the surveys, there was a flow of freshwater, estimated at around 0.1 cfs, from a drain pipe located along the left bank. This flow appears to be a source of freshwater feeding the wetland immediately down from the Aolele Street crossing of the channel. Some 200 feet upstream from the HDOT bridge, plant growth is established on deposited sediments in the channel. Plants here include pickleweed (*Batis maritima*) at less than 5-percent cover, kaluha (*Bolboschoenus maritimus*) at about 5-percent cover, and seashore paspalum (*Paspalum vaginatum*) covering more than 50 percent of the channel bottom. All three of these are wetland plants (OBL or FACW). Further upstream to just before the Aolele Street crossing, other wetland plants, including 'ae'ae (*Bacopa monnieri*; OBL) and sprangletop (*Leptochloa fusca*; FACW) become dominants. Water depth in this area was around 6 inches on July 5. Tilapia, mollies, and crayfish occur in the shallow water, indicating both a low salinity and a relatively permanent flow of freshwater mixing with the tidal water not thought to normally reach this far up channel. The water had a refractometer-measured salinity of 0 ppt. The concrete-lined channel terminates about 200 feet up channel from the Aolele Street bridge. The channel was cut out of a layered deposit of hardened limestone and lagoonal muds, and the channel dimensions remain more or less the same as the concrete-lined section down channel. The channel bottom is mostly a dark, indurated stone, functionally the same as concrete (i.e., impermeable). A layer of sediment up to 4 inches thick is deposited unevenly across the surface. This deposit supports the growth of herbaceous plants, the majority of which along the man-made channel and its banks are non-wetland plants. However, at a point some 650 feet up channel from the Aolele Street bridge, a collapsed drainage pipe is flowing fresh water into the channel from the left bank. This source of water has been of sufficient volume and duration to encourage the growth of wetland indicator plants in the thin soils of the channel bottom. The routine wetland determination data form provides wetland observations made for this area. The low chroma of the sediment may reflect a combination of origin (the dominant rock on the bed and banks is a dark grey mudstone), organic matter (judged to be less than 20 percent), and redoximorphic conditions. The relative proportions of each of these is difficult to ascertain, although the sediment dries to a sand or powder, suggesting minimal clay is present.

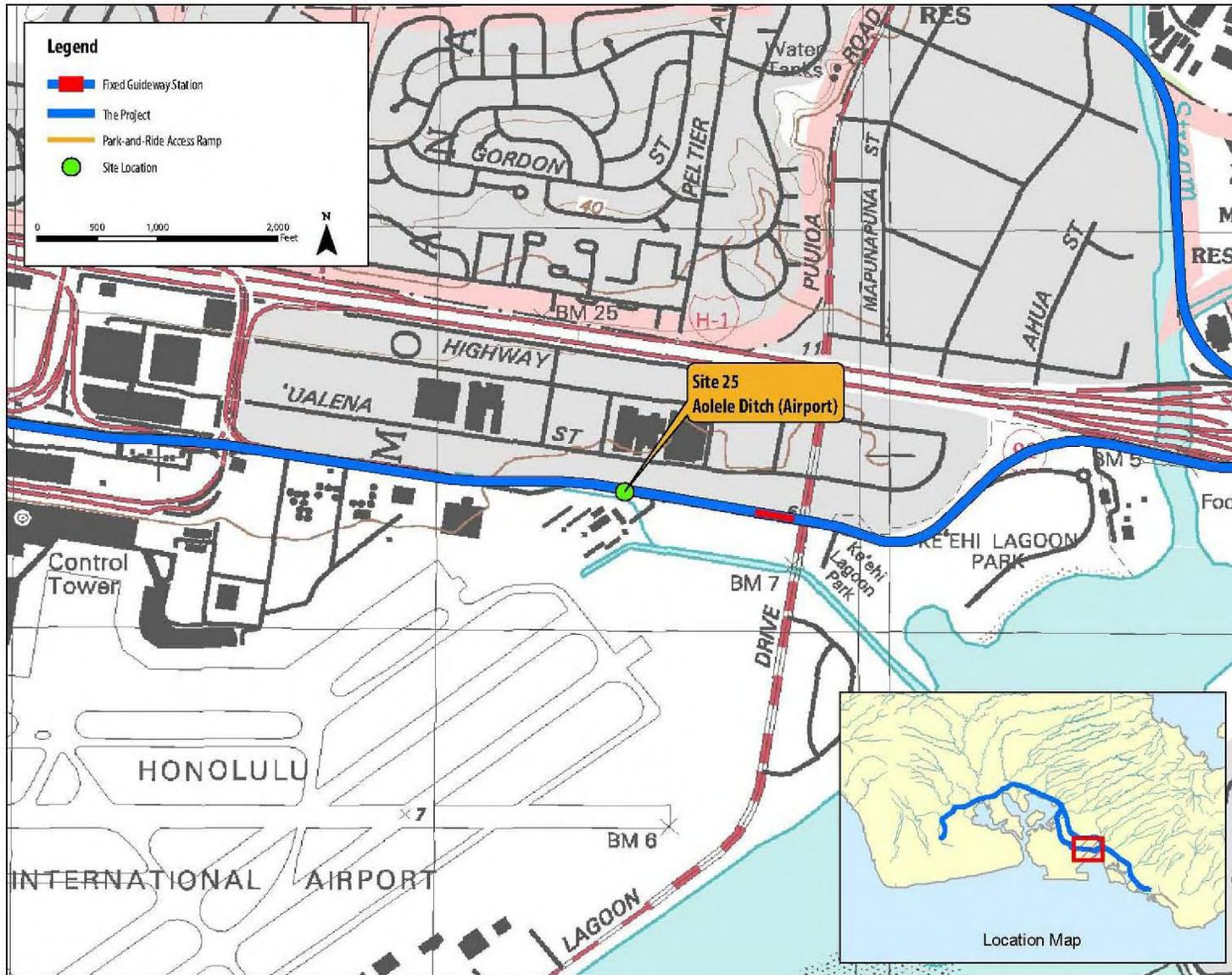
Potential Impacts

Above the point of tidal influence, from approximately 200 feet above the HDOT bridge to the Aolele Street bridge, the channel supports wetland vegetation on a thin layer of sediment over concrete. This wetland is brackish at the downstream end and apparently fresh water influenced at the upper end from an unknown but relatively permanent source reaching the channel through a drain pipe outlet. Further upstream, on the channel bottom cut out of indurated limestone and lagoonal mud deposits, an area supports a mixture of plants that are wetland and upland indicators. This area, approximately 350 feet in length, is influenced by yet another drain from the left bank. Further up channel, the bed supports only non-wetland plants to a point some 50 feet before the box culverts, where the channel is again concrete (and CRM) lined and wetted by a lateral drainage channel and here supports wetland vegetation on a thin sediment layer.

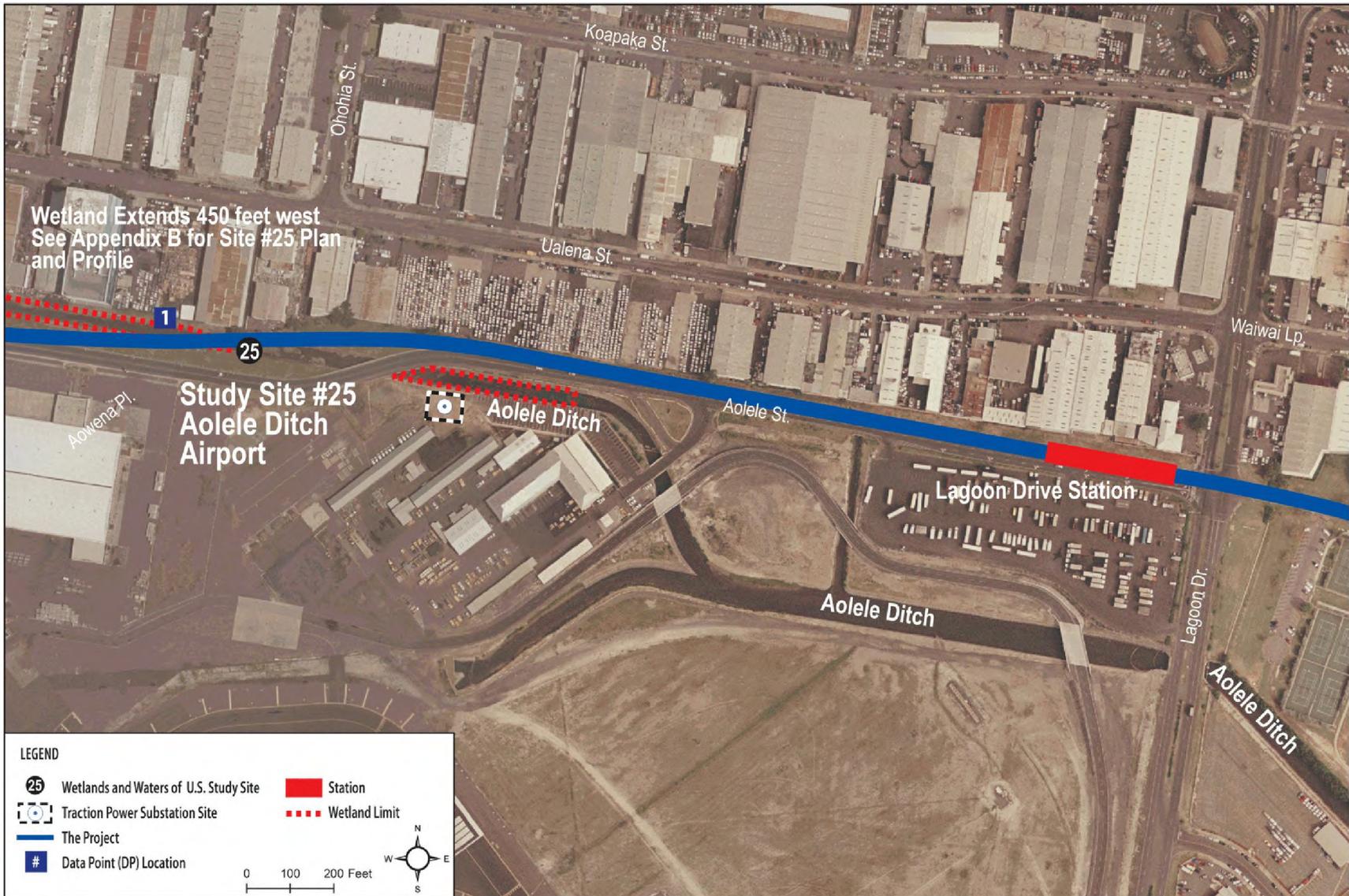
The Project is proposed to cross the Aolele Ditch in the area of the suspected wetland defined by data survey point 25. The support structure for the Project is to be straddle

bents with columns outside of Aolele Ditch. The lateral wetland boundary in this area follows the channel bottom, and any supports proposed for or outside of the top-of-bank line would avoid the wetland area (see Appendix B). Therefore, no impacts to waters of the U.S. would occur at this location. However, impacts, such as shading of the stream channel may occur at Site 25 from the Project.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 25A: Upstream left embankment



Photo 25B: Upstream view of bridge at left embankment



Photo 25C: Vegetation in stream bank



Photo 25D: Upstream view from road crossing looking at proposed rail crossing site (note conversion to grassy swale in background)



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 25.Aolele Ditch (Airport)</u>	Date: <u>7/5/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>E. Guinther</u>	State: <u>Hawaii</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 1</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Other Plant Species	Stratum	Indicator
1 <i>Paspalum vaginatum</i>	HERB	FACW+	8 <i>Ipomoea triloba</i>	HERB	NL
2 <i>Phaseolus lathyroides</i>	HERB	UPL	9 <i>Leptochloa uninervia</i>	HERB	FACW
3 <i>Bidens alba</i>	HERB	NL	10		
4 <i>Ludwigia octovalvis</i>	HERB	OBL	11		
5 <i>Cyperus polystachyos</i>	HERB	FAC	12		
6 <i>Malvastrum coromandelianum</i>	HERB	FACU	13		
7 <i>Bacopa monnieri</i>	HERB	OBL	14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 56%

Remarks: Listing is of plants that are common and abundant. Plant abundances extremely patchy over small areas.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>n/a</u> (In.) Depth to Free Water in Pit: <u>n/a</u> (In.) Depth to Saturated Soil: <u>1</u> (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input checked="" type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>Vegetated drainage channel cut into limestone substratum. Concrete and CRM lined downstream, eventually inundated (freshwater source unknown) over concrete and still further on, tidal.</u>	

SOILS

Map Unit Name (Series and Phase): <u>Fill land, mixed (FL)</u>	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/Size/Contrast	Texture, Concretions, Structure, etc.
0 - 6	A or O	2.5Y 3/1			Loamy sand with thin sandy layers (2.5Y 6/4)
>6	C				indurated limestone
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input checked="" type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>Soil is a thin deposit over indurated limestone; derived from sediment accumulated in the bed of a drainage channel cut into a limestone formation. 21.332824 N Latitude, 157.908935 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hydric Soils Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: _____		

Form Content Approved by HQUSACE 3/92

Category IVB—Mangrove Wetlands Proximate to the Project

Site 11B—Maintenance and Storage Facility near Leeward Community College (stormwater outfall to Pearl Harbor)

Site Summary

Site 11 consists of two locations: Site 11A—Maintenance and Storage Facility (maintenance facility) and Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor). Site 11A and Site 11B are located south of the Farrington Highway/H-1 Freeway Interchange and west of Leeward Community College at 21°23'31.472"N latitude and 157°59'16.770"W longitude and 21°23'17.896"N latitude and 157°59'16.079"W longitude, respectively (see the following Site 11 maps).

Site 11A—Maintenance and Storage Facility (maintenance facility)

Site 11A is a former navy drum storage site that is currently undeveloped. This location was investigated due to the proposed activity at such a large undeveloped area. During the on-site field surveys, no wetlands and/or non-wetland waters of the U.S. were observed. The site is a dry upland area with exposed soils and/or covered with upland plant species. The existing conditions were documented and recorded in the routine wetland data form (see the following Site 11 form). The approximate elevation of Site 11A is 90 feet.

Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor)

A stormwater outfall is proposed in the vicinity of this location; therefore, an on-site field survey of the proposed outfall area was conducted to document the existing conditions and, if present, delineate any waters of the U.S. During the on-site field surveys, a littoral wetland was observed and the boundary was delineated for incorporation into the design plans. The wetland delineation included three transects that were conducted perpendicular to the shoreline approximately 40 feet east, center, and west of the proposed stormwater outfall. Each transect consisted of two pits, one upslope and one downslope of the tidal wrack line. The routine wetland determination data forms provide additional detail on the delineation methods. This wetland is within the intertidal zone of a TNW, Middle Loch. The approximate elevation of Site 11B is 0 feet.

Site Description

The Waipi'o Peninsula divides Middle Loch and West Loch of Pearl Harbor. The property is actually at the head of Middle Loch with no significant surface drainage across the site, no defined link to upslope drainage areas, and no defined springs to the harbor at the shoreline. The site was first visited on 2-26-09 at 9:30 a.m. under clear no-rainfall conditions as documented in the following photographs.

Site 11A—Maintenance and Storage Facility (maintenance facility)

The site was revisited on 7-6-09. Site 11A is a former navy drum storage area that is approximately 20 acres in size. This area extends from Farrington Highway at an elevation of 80 to 90 feet approximately 1,000 feet down slope to a fenced border several hundred feet from the harbor and at an elevation of 30 to 40 feet. This area is an interfluvial hill, having a higher elevation than the community college to the east and the high school athletic field to the west. The area had been cleared at the time of the survey with large sections of graded bare earth. The remaining vegetated portions were typical of dry upland on leeward O'ahu, dominated by Guinea grass and koa-haole scrub, with a few kiawe trees present. There does not appear to be any source of drainage to the property from above and no drainage features on the land surface. Runoff appears to sheet flow to the south, east, and west, with no significant ponding on site. Below the fenced border, the property elevation drops quickly through dense koa-haole scrub to a former cane road paralleling the shoreline.

Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor)

The site was revisited on 6-19-09 and on 7-6-09. The shoreline is low sloping, consistent with typical offshore winds and a lack of significant wave energy within the harbor. However, at the proposed drainage outlet location, land behind the shore has been built up with soil and boulder fill. Here, the backshore drops some 3 feet as an eroding bank that the higher tides lap against. The high tide is marked by deposits of flotsam. Guinea grass, koa-haole, milo, and castor bean dominate the dry strand; juvenile mangroves and pickleweed appear in the intertidal areas immediately off the high tide shoreline. Part of the intertidal here was a dense mangrove thicket, removed in 2007, but now gradually reestablishing.

Several spring-fed wetlands occur along this northern coastline of Middle Loch and north of the Pearl City Peninsula (WCP 2007). In fact, a mitigation wetland (Kolea Cove wetland, DA Permit 1594-S; ACOE, 1999) is located some 200 feet west of the proposed drainline from the project maintenance and storage facility. The route selected for the drainline follows a piece of elevated land presently supporting a dirt road connecting between the cane road and the upland Navy parcel, avoiding all spring-fed wetlands in this general area.

Potential Impacts

Site 11A—Maintenance and Storage Facility (maintenance facility)

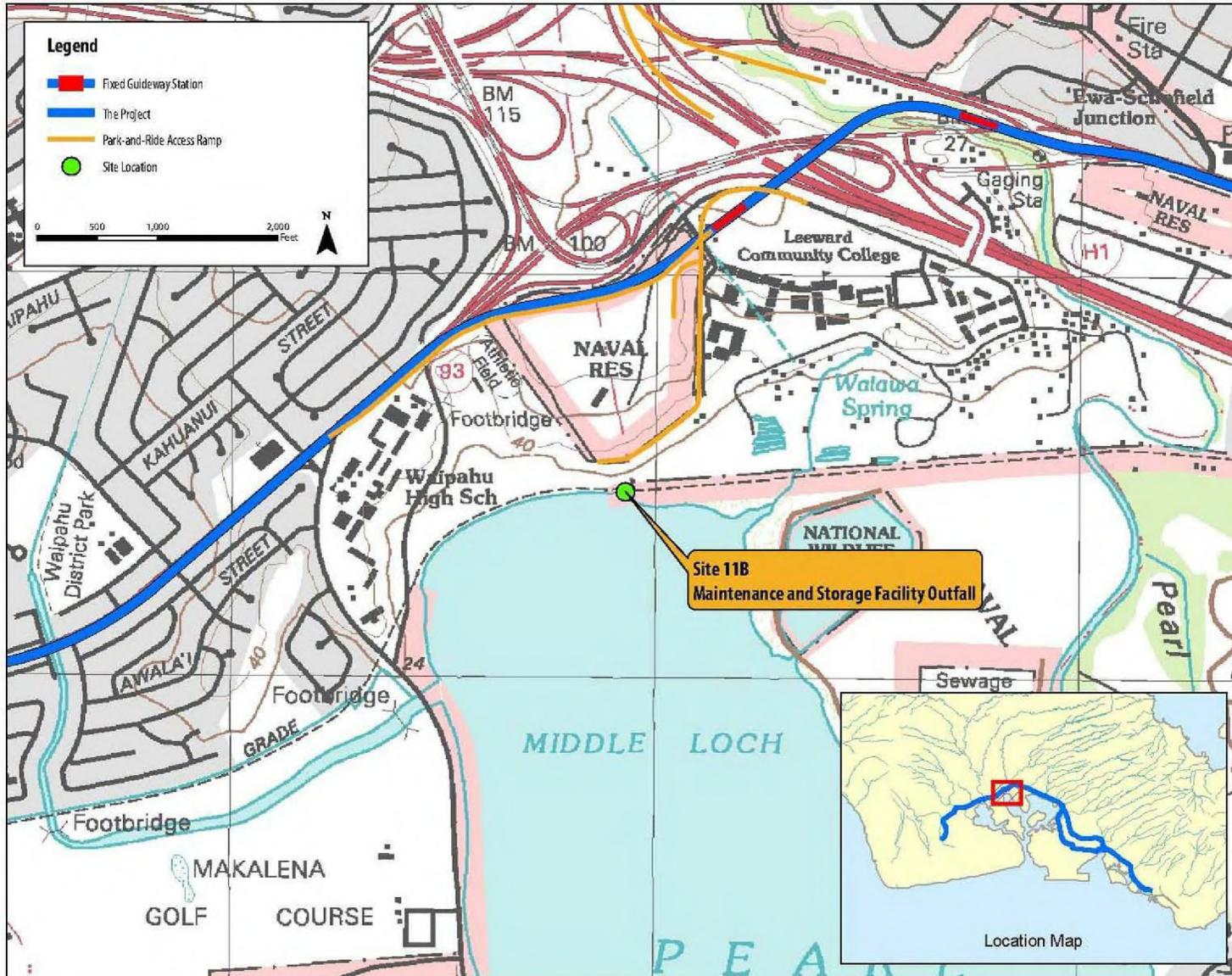
There are waters of the U.S., including wetlands and non-wetland waters, at this location; therefore, no impacts to waters of the U.S. would occur at Site 11A.

Site 11B—Maintenance and Storage Facility (stormwater outfall to Pearl Harbor)

An overflow stormwater outfall associated with the Project's preferred alternative for the maintenance and storage facility is proposed at Site 11B. A littoral wetland system has been delineated at Site 11B; however, the stormwater outfall will be outside of the

delineated wetland boundary and impacts to the littoral wetland are not anticipated at this time. If adjustments to the project design are required and would result in impacts to the littoral wetland; the potential impacts will be discussed in the Final EIS and the Section 404/10 permit application.

USGS Topographic Map



Site Photographs

Photo 11A: Lower property line facing west



Photo 11B: Top center of property



Photo 11C: Stormwater pooling location at top of property



Photo 11D: Middle Loch shoreline to the east



Photo 11E: Middle Loch shoreline to the west



Photo 11F: Upper shoreline to the east



Photo 11G: Upper shoreline to the west



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 11b. Maintenance & Storage Facility (Stormwater Outfall)	Date: 2/26/09; 6/19/2009; 7/6/2009 (EG)
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: A
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Rhizophora mangle</i>	SHRUB	OBL	8		
2 <i>Sesuvium portulacastrum</i>	HERB	FAC	9		
3 <i>Thespesia populnea</i>	SHRUB	FAC+	10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Juvenile (< 18" height) mangrove scattered from shoreline out to low tide line. *Batis* (pickle weed) patchy at narrow fringe on shoreline step. Milo close by on flat. Total cover by mangrove is low (est. < 2% by area), but this is a mangal cleared in 2007.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input checked="" type="checkbox"/> Other: Estuary Shoreline <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: _____ (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: 0 _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input checked="" type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: Shoreline site, tidal. Tide gauge data determines the ordinary high water mark is +1.08.	

SOILS

Map Unit Name (Series and Phase): Pearl Harbor, Clay, Tidal	Drainage Class: Poorly Drained Circle				
Taxonomy (Subgroup): Typic Tropaquepts	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-10	O	2.5Y 2.5/1			slick black mud with organic matter
10-18		dark greenish gray			sand, gravel
Hydric Soil Indicators:					
<input checked="" type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input checked="" type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input checked="" type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: 21.388088 N Latitude, 157.987426 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks:					

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 11B, Maintenance and Storage Facility (Stormwater Outfall)	Date: 6/19/2009; 7/6/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: A
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Panicum maximum	HERB	FACU	8		
2 Thespesia populnea	SHRUB	FAC+	9		
3 Tetragonia tetragonioides	HERB	NL	10		
4 Ricinus communis	SHRUB	FACU	11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 25%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input checked="" type="checkbox"/> Other: Estuary Shoreline <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands
Field Observations: Depth of Surface Water: 0 (in.) Depth to Free Water in Pit: >10 (in.) Depth to Saturated Soil: >10 (in.)	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks:	

SOILS

Map Unit Name (Series and Phase): Pearl Harbor, Clay	Drainage Class: Poorly Drained				
Taxonomy (Subgroup): Typic Tropaquepts	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-10		2.5Y 6/3			
-	-				
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: 21.388193 N Latitude, 157.987394 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Remarks: This pit dug less than one foot inland from high tide line (wrack line) and is 10-inch higher in elevation above intertidal flat.					

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Honolulu Rapid Transit/ Site 11B. Middle Loch Maintenance Facility Coastal Outfall	Date:	6/19/2009, 7/6/2009
Applicant/Owner:	City and County of Honolulu	County:	Honolulu
Investigator:	R. Bourke, E. Guinther	State:	HI
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID:	B
Is Area a Potential Problem Area? (if needed, explain on reverse)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID:	DP# 1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Rhizophora mangle</i>	SHRUB	OBL	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Mangrove re-establishing in former mangal on tidal flat.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands	<i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
<input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge		
<input checked="" type="checkbox"/> Aerial Photographs		
<input checked="" type="checkbox"/> Other: Estuary Shoreline		
<input type="checkbox"/> No recorded data available		
Field Observations:		
Depth of Surface Water: 0 (in.)		
Depth to Free Water in Pit: >18 (in.)		
Depth to Saturated Soil: <12 (in.)		
Remarks:		

SOILS

Map Unit Name (Series and Phase):	Drainage Class: Poorly Drained	Circle			
Taxonomy (Subgroup):	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-10	O	2.5Y 2.5/1			slick black mud with organic matter
10-18		2.5Y 3/1			sand/gravel
Hydric Soil Indicators:					
<input checked="" type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input checked="" type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: Organic peat and fine silt mixed and overlaying sand of reef flat. 21.388113 N Latitude, 157.987544 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Hydric Soils Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks:			

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 11B. Middle Loch Maintenance Facility Coastal Outfall	Date: 6/19/2009, 7/6/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: B
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Panicum maximum</i>	HERB	FACU	8		
2 <i>Thespesia populnea</i>	SHRUB	FAC+	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input checked="" type="checkbox"/> Other: Estuary Shoreline <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 0 (in.) Depth to Free Water in Pit: >16 (in.) Depth to Saturated Soil: >16 (in.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 Inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks:	

SOILS

Map Unit Name (Series and Phase): Pearl Harbor, Clay Taxonomy (Subgroup): Typic Tropaquepts	Drainage Class: Poorly Drained Circle Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0 - 16		2.5Y 6/3			sandy clay with gravel
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: Located one foot inland from wrack line and about ten inches higher in elevation. Appears to be fill. 21.388182 N Latitude, 157.987533 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
Remarks:					

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 11B. Middle Loch Maintenance Facility Coastal Outfall	Date: 6/19/2009; 7/6/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: C
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# 1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Batis maritima</i>	SHRUB	OBL	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input checked="" type="checkbox"/> Other: Estuary Shoreline <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 0 (in.) Depth to Free Water in Pit: >16 (in.) Depth to Saturated Soil: <12 (in.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input checked="" type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks:	

SOILS

Map Unit Name (Series and Phase): _____ Taxonomy (Subgroup): _____	Drainage Class: Poorly drained Circle Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0 - 16		10YR 5/2			sand with gravel & bits of wood (beach)
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils Listed on National Hydric Soils List			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Other (explain in remarks)			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils				
Remarks: 21.388227 N Latitude, 157.987812 W Longitude					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Hydric Soils Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Remarks: This is a narrow beach at shoreline, with <i>Batis</i> (obligate wetland plant).			

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 11B. Middle Loch Maintenance Facility Coastal Outfall	Date: 6/19/2009, 7/6/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, E. Guinther	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: C
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#2

VEGETATION					
Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Thespesia populnea</i>	SHRUB	FAC+	8		
2 <i>Paricum maximum</i>	HERB	FACU	9		
3 <i>Prosopis pallida</i>	SHRUB	FACU-	10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 33%

Remarks:

HYDROLOGY	
<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input checked="" type="checkbox"/> Other: Estuary Shoreline <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 0 (in.) Depth to Free Water in Pit: >16 (in.) Depth to Saturated Soil: >12 (in.)	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks:	

SOILS				
Map Unit Name (Series and Phase): Pearl Harbor, Clay	Drainage Class: Poorly Drained Circle			
Taxonomy (Subgroup): Typic Tropaquepts	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			
Profile Description:				
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast
0 - 16		2.5Y 6/3		Texture, Concretions, Structure, etc. sand clay, gravel
Hydric Soil Indicators:				
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils Listed on National Hydric Soils List		
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on Local Hydric Soils List		
<input type="checkbox"/> Suffidic Odor	<input type="checkbox"/> Concretions	Other (explain in remarks)		
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils			
Remarks: Excavated in face of slope. 21.388254 N Latitude, 157.987796 W Longitude				

WETLAND DETERMINATION			
Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Hydric Soils Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Remarks:			

Form Content Approved by HQUSACE 3/92

Site 16—Waimalu Stream

Site Summary

Site 16—Waimalu Stream is located along Kamehameha Highway at the bridge crossing over Waimalu Stream. The channel of the estuary of Waimalu Stream is concrete-lined upstream of the bridge and mostly modified soil banks downstream. The estuary opens onto East Loch of Pearl Harbor. Site 16 is located at approximately 21°23'10.213"N latitude and 157°57'8.523"W longitude (see the following Site 16 maps).

During the on-site field surveys, the perennial Waimalu Stream and associated tidal mangrove estuary was observed at Site 16. The existing site conditions were documented and recorded in the routine wetland determination data form (see the following Site 16 form). Based on the best available information and the on-site field surveys, Waimalu Stream (and the associated mangrove wetland) is an RPW that flows directly into East Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 7,797-acre Waimalu watershed is a second-order stream receiving significant (intermittent) inflow from Punanani Gulch just upstream of the Project. The Waimalu branch carries the larger proportion of the flow because it extends to the top of the Ko'olau Mountain Range, whereas the Punanani Gulch sub-watershed does not.

The site was visited on 3-24-09 at 08:30 a.m. under clear no-rainfall conditions as document in the following photographs. Twin two-lane bridges of Kamehameha Highway span the approximate 140-foot-wide canal. Above the highway, the stream is contained between very broad (150 feet apart), steep concrete banks topped with a chain link fence. Below the highway, the canal has soil banks averaging only about 100 feet apart and lined along their lower edge by mangrove. The channel runs about 1,200 feet downstream beside Blaisdell Park where it enters East Loch of Pearl Harbor.

The water elevation of the stream was referenced to a marked point on the bridge railing and the elevation of that point determined by a certified surveyor. A transect along the bridge indicated an average depth of 5.2 feet with a maximum depth of 6.2 feet. The predicted tide in Honolulu Harbor at this time was -0.83 foot below MSL, and the surveyed water elevation was a reasonably close -0.89 foot. The upstream OHWM at the bridge was measured as 8.93 feet above the channel bottom (an elevation of 2.84 feet above MSL), while the downstream OHWM at the bridge was approximately 7.6 feet above the bed (an elevation of 1.51 feet above MSL). Indicators of the OHWM included a clear line (stain) on the concrete channel walls, stain on the concrete bridge side abutments, and trash captured in the branches of mangrove trees along the stream banks.

The USGS supports a gage (No. 16223000) about 1,000 feet upstream of the H-1 Freeway at an elevation of 10 feet with a 19-year data record from 1952 to 1971 and measures outflow from 3,835 acres of the watershed. The annual average daily flow varied from

2.85 to 14.7 cfs with an average flow of 8.2 cfs. On 12 occasions during this period (approximately 2 out of every 3 years), the daily average flow exceeded 425 cfs, which should, therefore, be considered the channel forming (or bank full) flow for this stream. The maximum peak flow was just over 8,000 cfs, with an annual peak flow of 1,500 cfs or more occurring in about half of the record years. Water in the stream at Kamehameha Highway at the time of the survey was relatively turbid with a vertical visibility of only about 2 feet and had a refractometer-measured salinity of 31 ppt.

Fish life in the stream was not quantified but appeared to be both abundant and diverse, likely including a broad range of estuarine fish that inhabit both Pearl Harbor and the stream (mullet, milkfish, barracuda, tilapia, lai, etc.). Due to the concrete banks upstream and mangrove downstream, the latter was the only plant of significance. Examination of the channel edges beneath the bridges and downstream showed a significant accumulation of both trash and sediments caught by the mangrove root and trunk structures.

Potential Impacts

The Project would completely clear-span Waimalu Stream and associated mangrove wetlands at Site 16. Therefore, impacts to waters of the U.S. are not anticipated at this location. However, impacts, such as shading of the stream channel may occur at Site 16 from the Project. If changes in the design occur that may result in potential impacts to waters of the U.S., they will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 16A: Upstream right embankment



Photo 16B: Upstream left embankment



Photo 16C: Downstream left embankment



Photo 16D: Downstream right embankment (note mangroves along downstream channel)



Photo 16E: Makai bridge facing west



Photo 16F: Makai bridge facing east



Photo 16G: Bicycles and other debris along left embankment at makai bridge



Photo 16H: Debris along right embankment at downstream floodplain



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 16. Waimalu Stream</u>		Date: <u>3/24/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>		County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>		State: <u>HI</u>
Do Normal Circumstances exist on the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? <i>(if needed, explain on reverse)</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u>Rhizophora mangle</u>	Tree	OBL	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Mangrove is found downstream of highway crossing only; upstream is concrete-lined.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>62</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>USGS gage No. 16223000. Waters and vegetation fall within the existing high tide/ordinary high water mark.</u>	

SOILS

Map Unit Name (Series and Phase): _____		Drainage Class: _____			
Taxonomy (Subgroup): _____		Field Observations Confirm Mapped Type? Circle Yes No			
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: <u>No soil sample obtained.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Remarks: <u>Form used to document non-wetland waters' characteristics at this location.</u>			

Form Content Approved by HQUSACE 3/92

Site 20—‘Aiea Bay State Recreation Area

Site Summary

Site 20—‘Aiea Bay State Recreation Area is adjacent to Site 19 immediately south of the Kamehameha Highway viaduct and the western terminus of the Moanalua Freeway. The site encompasses the shore of ‘Aiea Bay, East Loch, Pearl Harbor. This area of estuarine shore was covered by a mature mangal (mangrove forest), but the trees were removed by the Navy in 2007 (WCP 2007). The approximate location of Site 20 is 21°22'32.43"N latitude and 157°56'2.071"W longitude (see the following Site 20 maps).

During the on-site field surveys, the ‘Aiea Bay and associated mangrove wetland were observed within the vicinity of Site 20. The existing conditions of the bay and mangrove wetland were documented and recorded in the routine wetland determination data form (see the following Site 20 form). The wetland delineation consisted of one transect of two pits that was conducted perpendicular to the presumed shoreline/wetland boundary at the point closest to the rail alignment. The location of the two pits was determined by vegetation type, tidal wrack line, and changes in the soil type and slope apparent from surface observation. The associated routine wetland determination data form provides further detail on the activity of the wetland delineation. Based on the best available information and the on-site field surveys, the ‘Aiea Bay and associated mangrove wetland are tidally influenced TNWs (East Loch) connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 1,301-acre ‘Aiea watershed consists of a single narrow valley that extends only about half way to the top of the Ko‘olau Mountain Range. Although the ‘Aiea Stream (Site 19) is listed as perennial, there is no record of it having been gauged for flow, and the stream is often noted to dry up during summer months in its mid-reaches. At least 80 percent of the watershed is either urban or business, and the stream has been channelized through much of its urban length.

The site was visited on 3-24-09 at 2:40 p.m. under clear skies as documented in the following photographs. The site was revisited on 6-19-09 and 7-05-09 for delineation and confirmation. This site consists of the land bounded by the Kamehameha Highway east-bound on-ramp to the H-1 Freeway to the north, Kamehameha Highway to the east, ‘Aiea Stream to the west, and Pearl Harbor to the south. A deposition delta presently bends the stream channel to the left (south) with the delta supporting the growth of grasses, pickleweed, and mangrove. The mangrove forest (mangal) that stood here was cleared in 2007, but numerous new mangrove seedlings are rooting on the shallow mudflat of the bay.

The OHWM, as evidenced by the high wash of flotsam on the shoreline, tends to coincide with a steep, eroding bank at the shore.

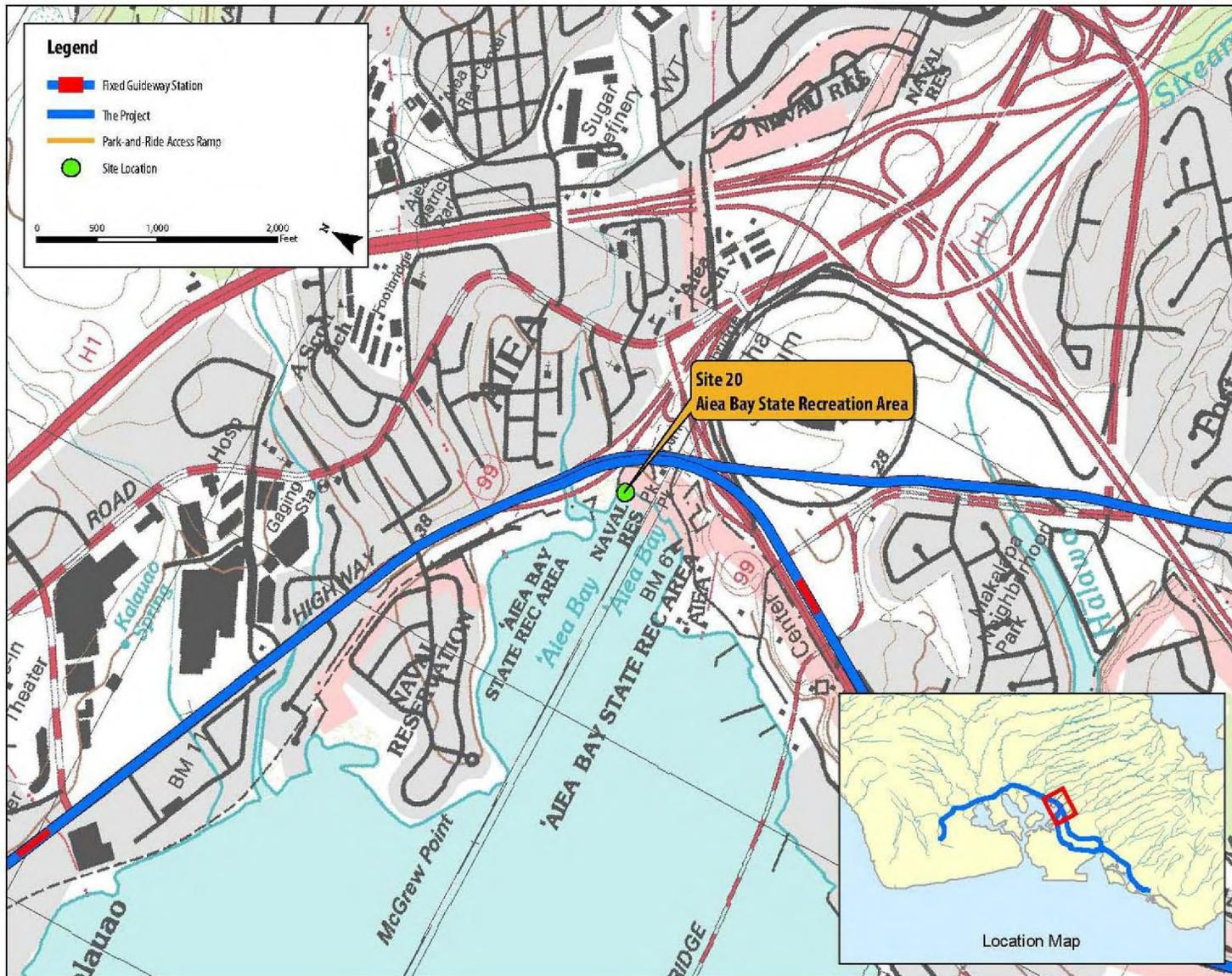
The mudflats of the stream delta likely provide foraging habitat for Hawaiian Stilt. In the stream delta deposits, both pickleweed (*Batis maritimus*) and small mangrove are plentiful.

Examination of the mud in the delta showed it to be a mix of sand and mud, with black discoloration and a sulfidic odor. The upper edge of the soft sediments reach close to the erosional escarpment. The base of the erosional escarpment supports a growth of pickleweed (*Batis maritima*).

Potential Impacts

The landward edge of the mangrove wetland is at the base of the shoreline erosional escarpment. The Project right-of-way does not infringe upon the mangrove wetland as it is located several hundred feet to the north of the 'Aiea Bay and associated wetland. Therefore, no impacts to waters of the U.S. are anticipated at this location. However, If changes in the design occur that may result in potential impacts to waters of the U.S., they will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 20A: Panorama view of 'Aiea Stream delta wetland adjoining East Loch (note mangroves and pickleweeds along shoreline)



Photo 20B: Right-of-way alignment facing east



Photo 20C: Right-of-way alignment facing west



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 20. Aiea Bay State Recreation Area</u>	Date: <u>3/24/2009; 6/19/09; 7/5/2009 (EG)</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler, E. Guinther</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: <u>A</u>
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 2</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u><i>Panicum maximum</i></u>	HERB	FACU	8		
2 <u><i>Thespesia populnea</i> (saplings only)</u>	SHRUB	FAC+	9		
3 <u><i>Pithecellobium dulce</i> (saplings only)</u>	SHRUB	NL	10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: _____

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>None</u> (In.) Depth to Free Water in Pit: <u>> 18"</u> (In.) Depth to Saturated Soil: <u>> 18"</u> (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>Steep, eroding bank in fill above high tide line.</u>	

SOILS

Map Unit Name (Series and Phase): <u>Rock Land (rRK)</u>	Drainage Class: _____ Circle				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-18	A	10YR 7/3			Sandy gravelly fill
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>Pit located on face of 3' high bank at about 18" above shoreline. Appears to be fill material. 21.375673 N Latitude, 157.933558 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Hydric Soils Present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Remarks: <u>This data point represents a sharp escarpment of probable fill material rising from intertidal to an elevation of +3-4 ft above MSL.</u>			

Form Content Approved by HQUASACE 3/92

Site 22—Hālawā Stream (Makai-Airport)

Site Summary

Site 22—Hālawā Stream (Makai-Airport) is located along Kamehameha Highway where the bridges of the highway cross over the estuary of Hālawā Stream. The estuary is confined to a modified channel downstream of the bridges, while the upstream portion (northeast of bridges) flows within a natural channel. The estuary opens onto East Loch of Pearl Harbor beside the Arizona Memorial. The approximate location of Site 22 is 21°21'54.000"N latitude and 157°56'14.000"W longitude (see the following Site 22 maps).

During the on-site field surveys, the Hālawā Stream and mangrove wetland (downstream of bridge crossing) was observed and the existing conditions were documented and recorded in the routine determination data form (see the following Site 22 form). Tidal wetlands have been identified, upstream of Site 22, within the estuary in previous surveys (ACOE 1994; WCO 2007). Based on the best available information and the on-site field surveys, the Hālawā stream is a TNW that discharges into East Loch, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 9,442-acre Hālawā watershed drains the large Hālawā Valley to the peak of the Ko'olau Mountain Range.

The site was visited on 3-26-09 at 10:00 a.m. under clear no-rainfall conditions as documented in the following photographs. Normally, two traffic bridges cross Hālawā Stream at this location. However, the makai (southbound) bridge was undergoing repairs and a temporary bridge has been constructed in the open space between the bridges on the alignment for the rapid transit right-of-way. The stream channel is estuarial, extending into Pearl Harbor, with mangroves lining a portion of the channel. The channel width is approximately 110 feet across the mauka rail of the mauka bridge. The water averaged 3 feet deep with a maximum depth of 4.5 feet as measured at 10:12 a.m. with a Honolulu Harbor tide height of 0.06 foot above MSL.

The water elevation of the stream was referenced to a marked point on the bridge railing, and the elevation of that point determined by a certified surveyor. At the time of the survey, the tide elevation (Honolulu Harbor) was -0.76 foot and the water surface elevation was measured at -0.67 foot. The OHWM was determined to be approximately 4.93 feet from the bottom of the streambed and at an elevation of 1.26 feet above MSL, as evidenced by staining on the concrete and the buildup of vegetative matter to this elevation on one side of the channel.

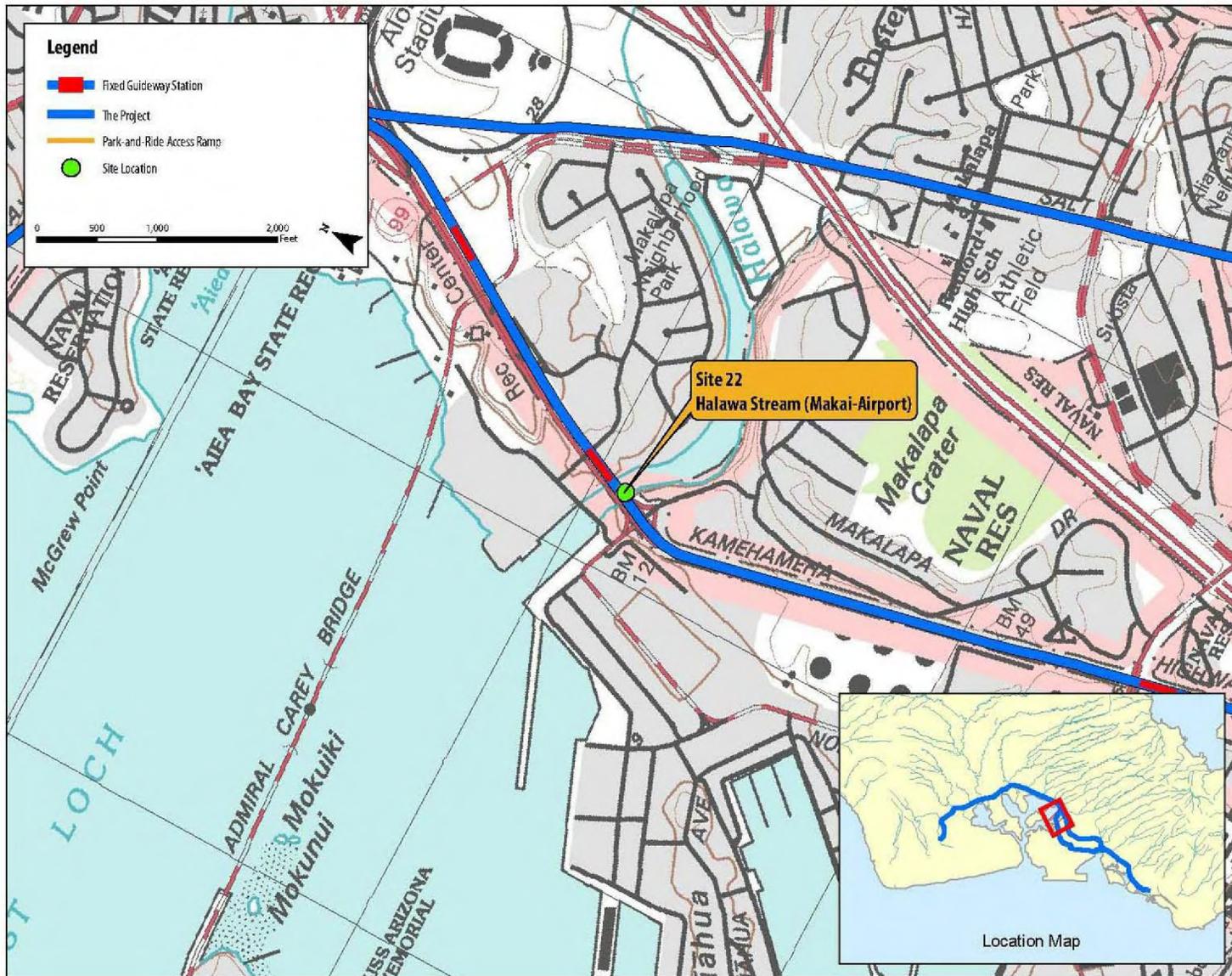
The USGS supports several gages along this stream, the lowest of which (No. 16227000) is at an elevation of 16 feet, approximately 1.5 mile upstream just below the H-1 Freeway. Flow measurements taken between 1954 and 1979 show a maximum peak flow of about 6,500 cfs, with two readings above 4,000 cfs and roughly half of the annual peak flow readings above 2,000 cfs. The annual mean flow from 1954 to 1961 varied from 6 to 18 cfs.

Water is permanently in the channel at this site because the bottom of the channel is well below the lowest tides. The refractometer-measured salinity was 27 ppt.

Potential Impacts

The Project would completely clear-span the Hālawā Stream and the mangrove wetland is beyond the Project limits; therefore, impacts are not anticipated to occur to waters of the U.S. at this location. However, impacts, such as shading of the stream channel may occur at Site 22 from the Project. If changes in the design occur and impacts are anticipated, these impacts will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 22A: Right embankment at mauka bridge



Photo 212B: Upstream view of extensive mangrove on both banks



Photo 22C: Across stream under bridge



Photo 22D: Upstream view of mangroves on bank under bridge



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 22. Halawa Stream (Makai-Airport)</u>	Date: <u>3/26/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Rhizophora mangle</i>	Tree	OBL	8		
2 <i>Batis maritima</i>	Shrub	OBL	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Both banks upstream and downstream of bridges are overgrown with mature mangrove, the aerial roots of which extend down from branches into open water. Normal circumstances do not exist as site is part of bridge construction.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks)	Wetland Hydrology Indicators:	Primary Indicators: <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
<input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available			
Field Observations: Depth of Surface Water: <u>36</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)			
Remarks: USGS Gage No. 16227000. This is a tidal estuary.			

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil sample was obtained. Sediment bars of mostly sand and gravel.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Wetlands (mangal) along the channel margins. Bars are dominated by obligate wetland plants.	

Form Content Approved by HQUASACE 3/92

Site 26—Kahauiki Stream

Site Summary

Site 26—Kahauiki Stream is located on the man-made estuarine channel of Kahauiki Stream at Shafter Flats, Fort Shafter. At this site, the estuary joins Moanalua Stream, also a tidal estuary (see Site 24, which is adjacent). Moanalua Stream flows into Ke'ehi Lagoon. The approximate location of Site 26 is 21°20'11.225"N latitude and 157°53'36.128"W longitude (see the following Site 26 maps).

During the on-site field surveys, the Kahauiki Stream (tidal estuary) and areas that support and/or have supported in the recent past mangroves (obligate wetland plant) were observed at Site 26. The existing site conditions were documented and recorded in the routine wetland determination data form. Based on the best available information and the on-site field surveys, the Kahauiki Stream is a tidal estuary, at this location, and likely supports/supported a mangrove wetland and, therefore, an RPW connected to Ke'ehi Lagoon (TNW), an embayment of the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 6,778-acre Moanalua watershed drains from two parallel valleys up to the top of the Ko'olau Mountain Range through major urban and light industrial areas of Māpunapuna to the Ke'ehi Lagoon section of Honolulu Harbor. Kahauiki is the final tributary joining Moanalua before it empties into Ke'ehi Lagoon and drains all of Fort Shafter below and above the H-1 Freeway and partially up onto the lower slopes of the Ko'olau Mountain Range.

The site was visited on 05-05-09 at 11:15 under clear skies as documented in the following photographs. This reach extends from the junction with Moanalua Stream up to the H-1 Freeway, a distance of about 3,000 feet, and then up through Fort Shafter as a bifurcating concrete box channel.

The following aerial site map shows a significant mangrove overgrowth of the channel. However, the site visit revealed that the mangroves have since been removed. Discussions with maintenance personnel revealed that all of the mangrove were removed within the last year to reduce the flood hazard created by the blocked channel.

At the time of the inspection, only relatively few mangrove seedlings were observed rooting up to the intersection with Moanalua Stream. Two soil pits in the channel showed inconsistent mottling in the muddy sand with pockets of hydric soils intermixed with aerobic soils. The soils did not have any sulfidic odor.

The riparian vegetation is dominated by managed grass on the upper banks with a few Keawe trees and coconut palms. The open water character of the canal would likely support foraging habitat for waterfowl, although only a single Black-crowned Night Heron was noted at the site. In addition to plentiful tilapia, a single barracuda was observed.

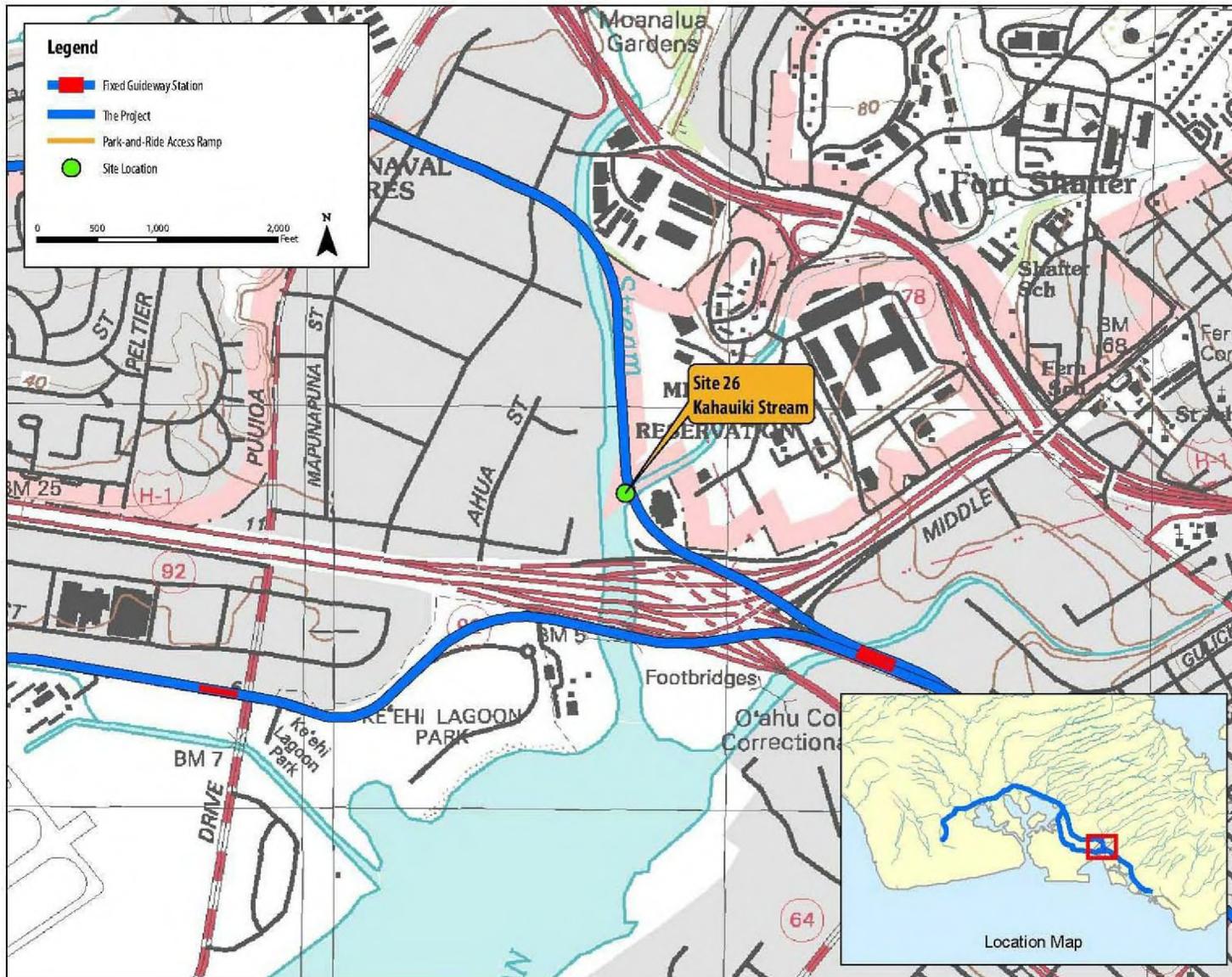
Of interest here is the lack of sediment within the aerial root matrix (lower part of the photo) that is reaching into Moanalua Stream. Water clarity was poor, with a salinity of 31 ppt.

This is an atypical site as all the wetland vegetation has been recently removed. OHWM was extrapolated to this site from the adjacent Moanalua Stream

Potential Impacts

Site 26 is located along the Salt Lake alignment, which was not selected as the preferred alignment. Therefore, no impacts to waters of the U.S. would occur at this location.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 26A: Upstream view of right embankment (note all mangroves had been removed)



Photo 26B: Downstream view to junction with Moanalua Stream



Photo 26C: Moanalua Stream showing cross-section of mangrove on bank



Photo 26D: Soil sample from canal bank



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 26.Kahauiki Canal	Date: 4/2/09
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-):

Remarks: No wetland plants. 100% open mud flats. However, ample evidence of recent removal of mangal (*Rhizophora mangifera*), an obligate wetland plant of tidal lands. Aerial photographs show previous dense mangrove growth.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 12 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: Tidal estuary.	

SOILS

Map Unit Name (Series and Phase): _____ Taxonomy (Subgroup): _____	Drainage Class: _____ <i>Circle</i> Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input checked="" type="checkbox"/> Aquatic Moisture Regime <input checked="" type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: Dug three (3) shallow soil pits; these showed evidence of subsurface anaerobic conditions.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Recent removal of mangroves has changed the character of the location.	

Form Content Approved by HQUSACE 3/92

Category V—Structural Elements of the Project in Waters of the U.S.

Site 1—Lower Kalo‘i Gulch (Site 1)

Site Summary

Site 1—Lower Kalo‘i Gulch (approximate elevation 80 feet) crosses fallow agriculture land south of Farrington Highway and east of Kapolei Golf Course. Historically, Site 1 was a gulch with infrequent stream flows that dissipated across a “karst” feature known as the ‘Ewa Plain (see the following Site 1 maps). As land uses on the ‘Ewa Plain have shifted from agricultural to urban, improvements to the drainage in Kapolei and ‘Ewa Beach have resulted in redirection of flood flows into a series of detention and retention basins (AECOS 1992, 2005). During extreme flood flows, via detention/retention basins and associated connected dry channels, stormwater run-off could reach the Pacific Ocean (TNW) at a point along the shore east of One‘ula Beach Park. The USACE has asserted jurisdiction of the Kalo‘i Gulch in previous jurisdictional determinations (Dadey 1996). The approximate location of Site 1 is 21°20'54.470"N latitude and 158°03' 20.183"W longitude.

During the field surveys, no wetland conditions were observed; however, the Lower Kalo‘i Gulch is present and the existing conditions of the gulch were documented and recorded in the routine wetland determination data form (see the following Site 1 form). The on-site field surveys and best available information suggest that Kalo‘i Gulch is a non-RPW with a potential ecological nexus to a TNW. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 16,814-acre Kalo‘i watershed drains about 6,000 acres on the slopes of the relatively dry southern extension of the Wai‘anae Mountain Range and infiltrates runoff into the balance of the watershed extending across the relatively flat ‘Ewa plain. The site was visited on 2-20-09 at 8:00 a.m. under clear skies as documented in the following photographs. The site was accessed from the parking lot of the Kapolei Golf Course to the west. As can be seen in the panoramic photo (Site 1A), the actual alignment of the Hunehune Gulch and Lower Kalo‘i Gulch is not readily apparent from the ground level (Site 1B) as they are almost completely overgrown with tall grasses (principally *Panicum maximum* or guinea grass), koa-haole, and castor bean. As the combined alignment of the two gulches was approached through the 4- to 8-foot-tall shrubs, several remnant man-made agricultural ditches were traversed prior to locating the main channel of the Lower Kalo‘i Gulch. The main channel of the Lower Kalo‘i is incised at least 6 feet deep with a bed about 2 feet across and steep sloping side walls (Site 1C). The entire bed and banks consist of soil, a few rocks, or graded bed material. The week prior to the field visit, a significant rainfall caused flow in the gulch. Evidence of silt deposition and bent foliage

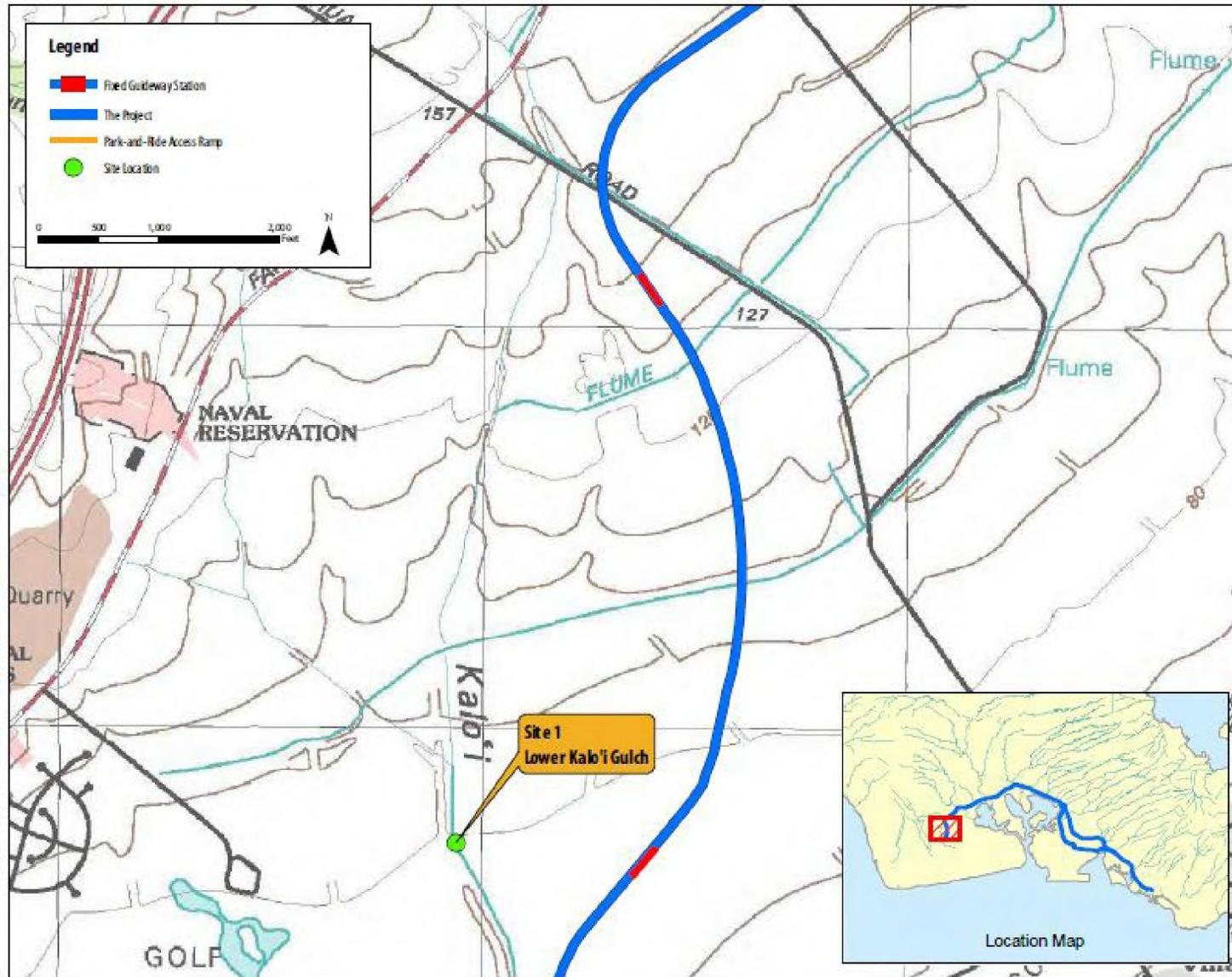
suggests that the flow had been up to 2 feet deep in the channel. Two 24-inch test holes dug into the bed of the stream exposed moist sandy soil but did not encounter either groundwater or indications of hydric conditions. Downstream of the site, a detention basin can be seen under construction near the site (Site 1A).

The USGS maintains a staff gage (16212450) on Kalo'i Gulch at an elevation of 260 feet located just above the H-1 Freeway. The 40-year record from this site shows a maximum peak flow of about 720 cfs, with peak flows of 120 cfs being exceeded one out of every two years. Because this stream only flows during active rainfall events, there is no daily average flow data available. The OHWM was determined to be approximately 1.5 feet from the bottom of the streambed, as indicated by the destruction of terrestrial vegetation and the change in the character of the soil.

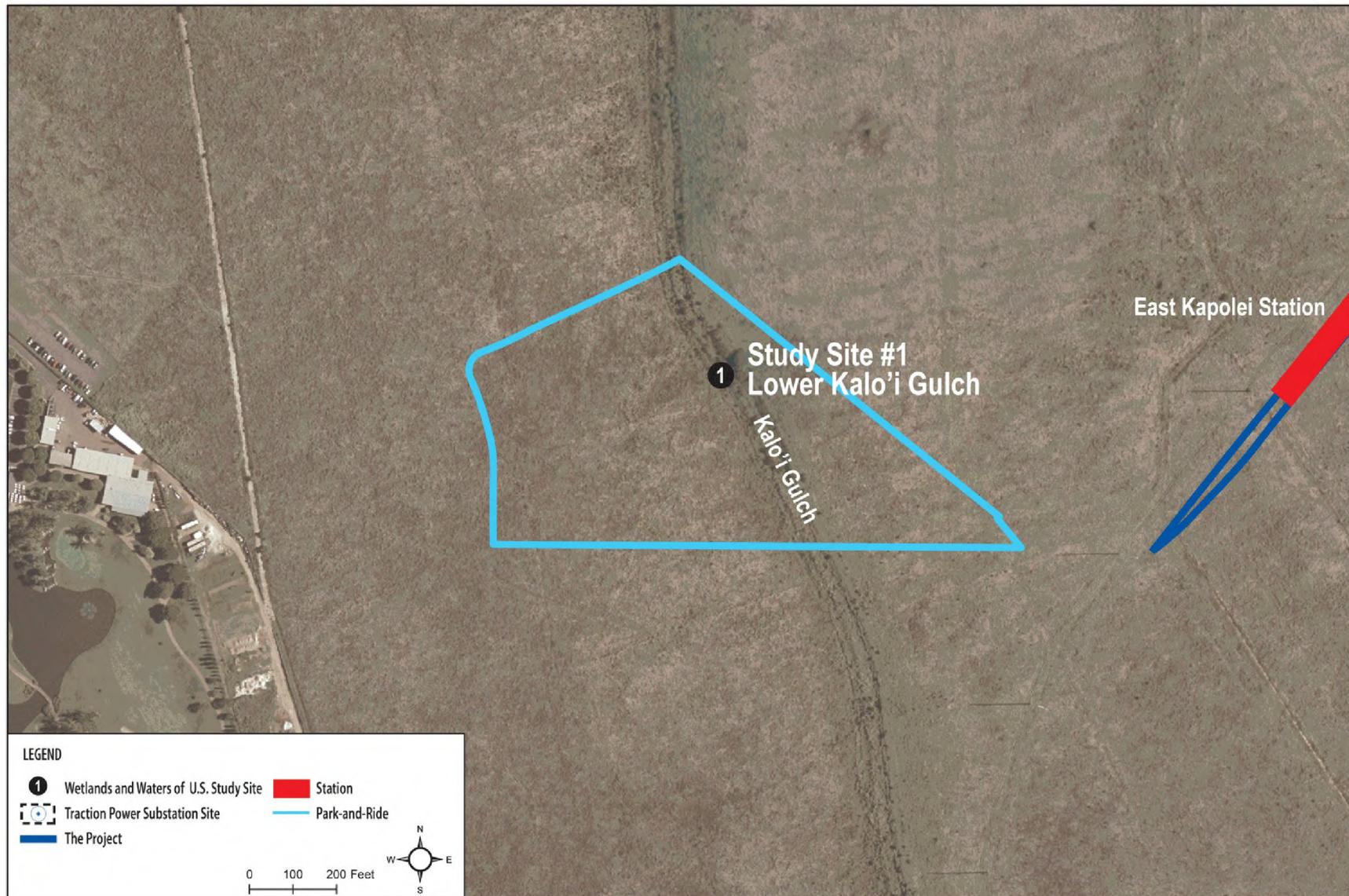
Potential Impacts

Considering that extensive development is planned for all of the surrounding parcels, it seems evident that the channel will be abandoned or converted to concrete-lined culverts and drainage directed into one or more drainage swales and detention basins developed or under development downslope. A park-and-ride station is proposed at this location that may result in various impacts to the Lower Kalo'i Gulch, such as redirection of the channel, fill material, and/or shading/clearing of the adjacent vegetation. Once the final design is complete and the exact impact type/amount can be determined, impacts will be reported in the Section 404 and Section 10 permit application and/or the environmental impact statement.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 1A: View to the east across Kalo'i Gulch



Photo 1B: Close-up view of Kalo'i Gulch (figure standing at edge of channel)



Photo 1C: Standing inside channel, showing water elevation of 8 cfs flow from recent storm



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 1. Lower Kaloi Gulch	Date: 2/20/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Panicum maximum</i>	HERB	FACU	8		
2 <i>Leucaena leucocephala</i>	TREE	UPL	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: Site dominated by Guinea Grass (*Panicum maximum*) and koa haole (*Leucaena leucocephala*).

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: 0 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: Primary Indicators: <input type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: USGS gage No. 16212450 above site at elevation at 260-ft on Kaloi Gulch. Peak flow data only. Incised narrow altered channel through fallow agriculture lands. Flow is intermittent.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes <input type="checkbox"/> No <input type="checkbox"/>				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
					moist, sandy
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: Soil sample not taken. Definable bed and banks of an intermittent gulch.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Form used to document non-wetland waters' characteristics at this location.	

Form Content Approved by HQUSACE 3/92

Site 2—Upper Kalo‘i Gulch

Site Summary

Site 2—Upper Kalo‘i Gulch (approximate elevation 140 feet) crosses fallow agriculture land south of Farrington Highway and east of Kapolei Golf Course. Historically, Site 1 was an intermittent gulch with infrequent stream flows that dissipated across a “karst” feature known as the ‘Ewa Plain (see the following Site 2 maps). As land uses on the ‘Ewa Plain have shifted from agricultural to urban, improvements to the drainage in Kapolei and ‘Ewa Beach have resulted in redirection of flood flows into a series of detention and retention basins (AECOS 1992, 2005). During extreme flood flows, via detention/retention basins and associated connected dry channels, stormwater run-off could reach the Pacific Ocean (TNW) at a point along the shore east of One‘ula Beach Park. The USACE has asserted jurisdiction of the Kalo‘i Gulch in previous jurisdictional determinations (Dadey 1996).

During the field surveys, no wetlands conditions were observed; however, data for Site 2 was documented and recorded in the routine wetland determination data form (see the following Site 2 form). The on-site field surveys and best available information suggest that Kalo‘i Gulch is a non-RPW with an ecological nexus to a TNW. The approximate location of Site 2 is 21°21'38.797"N latitude and 158°03'11.160"W longitude. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 16,814-acre Kalo‘i watershed drains about 6,000 acres on the slopes of the relatively dry southern extension of the Wai‘anae Mountain Range and infiltrates runoff into the balance of the watershed extending across the relatively flat ‘Ewa Plain.

The site was visited on 2-20-09 at 9:00 a.m. under clear skies as documented in the following photographs. The site was accessed from Pālehua Road. The area was under active construction at the time of the visit. A portion of the construction includes the creation of a drainage swale that will carry flows diverted from Kalo‘i Gulch to a retention basin under construction closer to Site 1. A construction ford had been created across the channel and was the location of the up and downstream photos (Sites 2A and 2B). The channel is measurably wider at this location than at Site 1. The swale is 8 to 12 feet deep with an active bed 5.5 feet across at the bottom and steep sloping sides. The majority of the banks and bed consists of soil with rocks and graded gravels in the bed. Large bed rocks seen in the Site 2B photograph were placed downstream of the vehicle ford, likely as an erosion control measure. The week prior to the field visit, a significant rainfall resulted in flow in the gulch. Evidence of silt deposition and bent-down foliage suggests that the flow had been up to 1.5 feet deep in the channel at this site. One 24-inch-deep test hole dug into the bed of the stream exposed moist sandy soil but did not encounter either groundwater or anaerobic sediments.

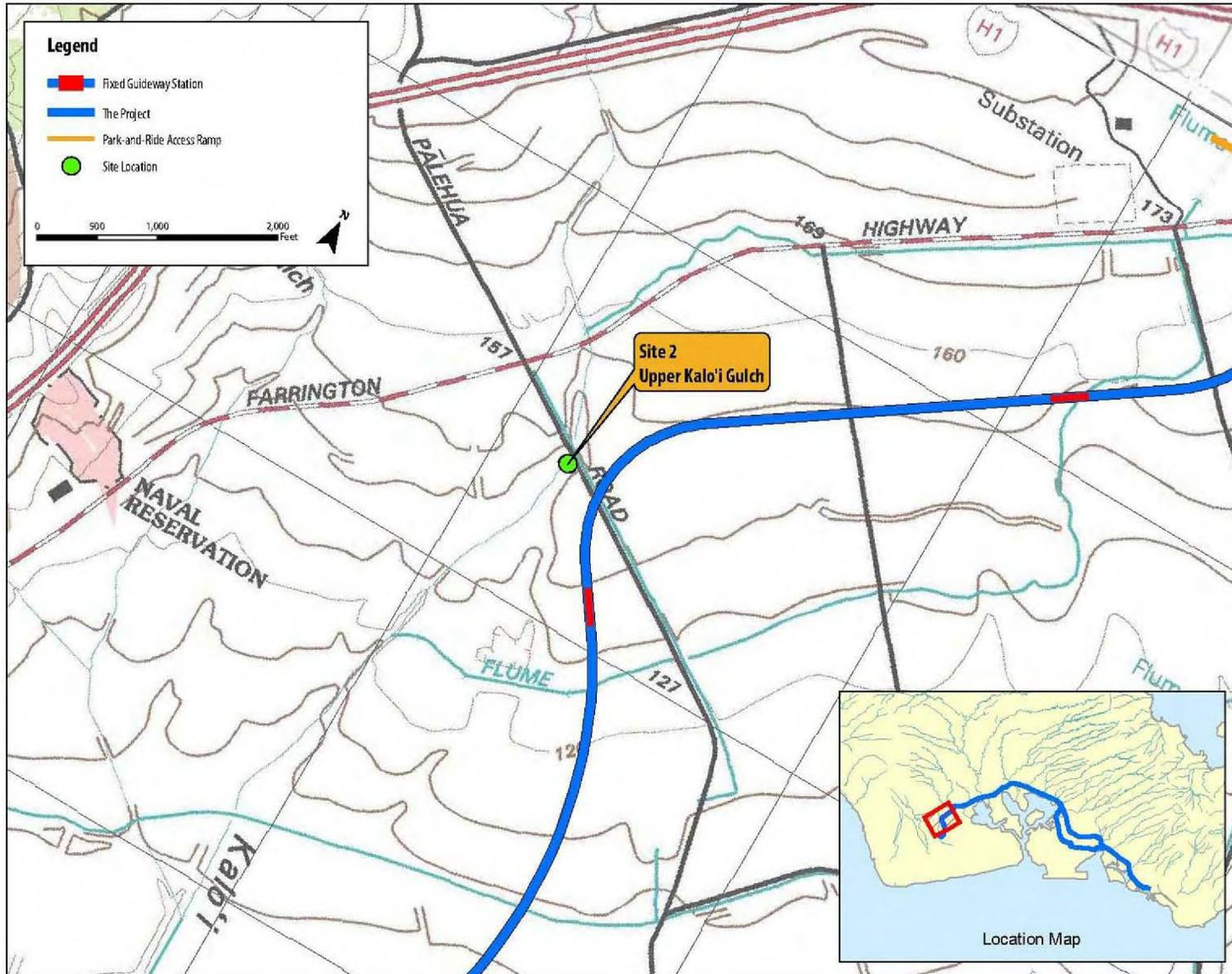
The USGS maintains a staff gage (No. 16212450) on the Kalo‘i Gulch at an elevation of 260 feet located just above the H-1 Freeway. The 40-year record from this site shows a maximum peak flow of about 720 cfs, with peak flows of 120 cfs being exceeded one out of

every two years. Because this stream only flows during active rainfall events, there are no daily average flow data available. In addition, a discernable OHWM is not present at Site 2 due to the infrequent water flows in response to rainfall events.

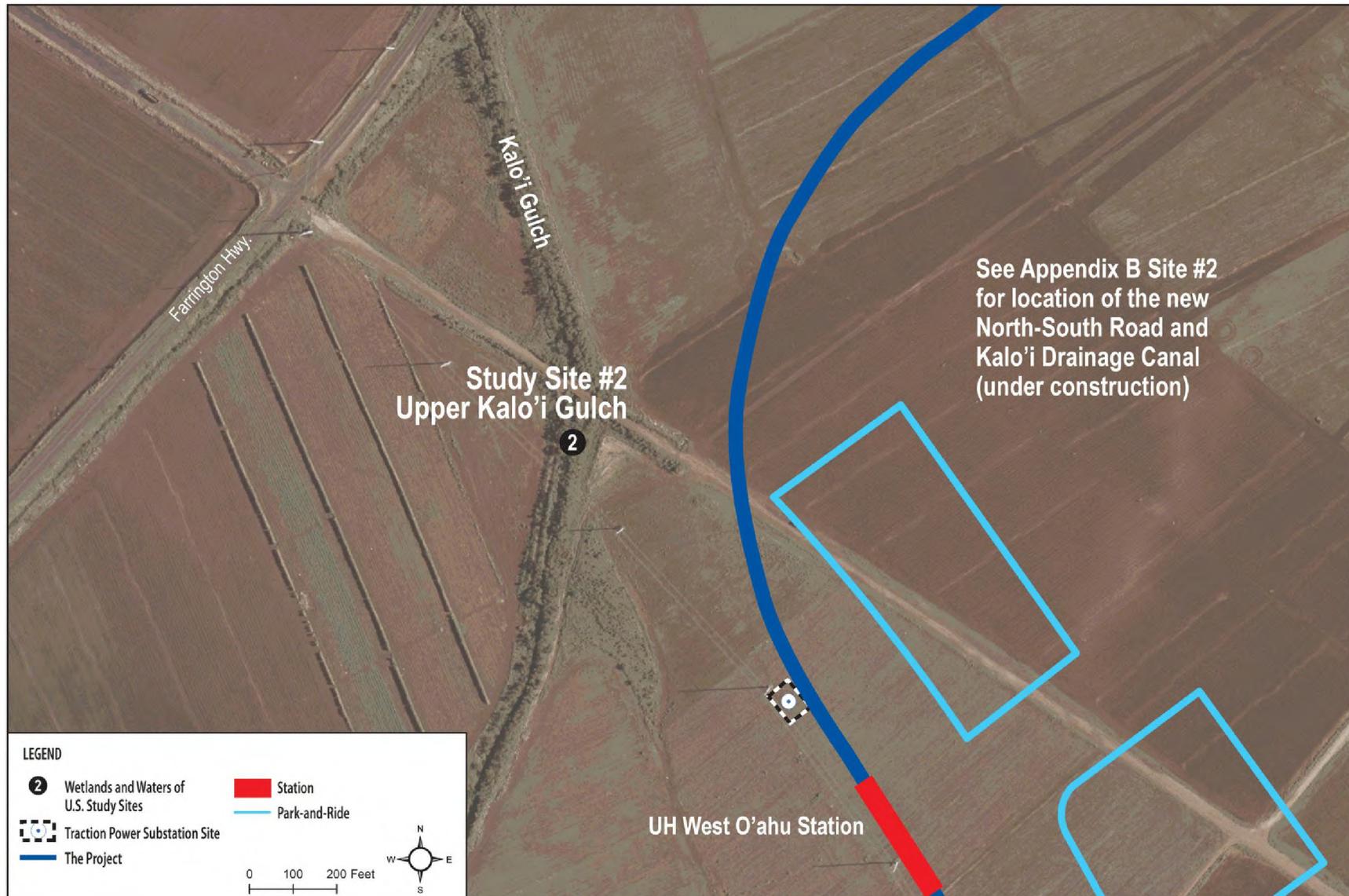
Potential Impacts

The present channel of Kalo'i Gulch in the Project area is actually a man-made, unlined ditch constructed during the agricultural period and not the natural channel of the intermittent stream that existed prior to the planting of sugar cane sometime before the 1930s. The Project is located over 200 feet from Kalo'i Gulch at this site. However, the Kalo'i Drainage Canal is presently under construction along the east side of the North-South Road (also under construction). When completed, the Kalo'i Drainage Canal will intercept storm water flow from Kalo'i Gulch. The smaller, man-made channel in this area (Site 2) will be abandoned. Storm flows from Hunehune Gulch will continue to feed into Kalo'i Gulch further downslope (Site 1). At Site 2, the guideway will be squeezed between the North-South Road, an energy corridor, and the Kalo'i Drainage Channel, with the result that two support columns will be located on the lower part of the banks of the canal (see Appendix B). It is not possible to reasonably establish whether these columns impinge on an OHWM because this feature is an under-construction, man-made channel of a non-RPW. The potential impacts that may occur at Site 2 from the Project include potential placement of fill material (i.e., pier columns and associated material), shading, and clearing of adjacent vegetation. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 2A: Upstream view at construction crossing



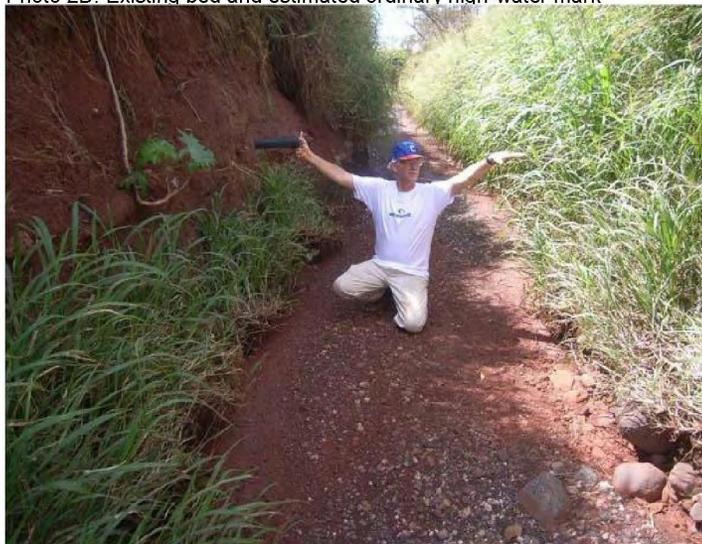
Photo 2B: Downstream view of placed revetment below construction crossing



Photo 2C: New drainage swale under construction



Photo 2D: Existing bed and estimated ordinary high-water mark



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 2. Upper Kaloi Gulch	Date: 2/20/2009
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP# _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Panicum maximum</i>	HERB	FACU	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): < 10%

Remarks: The site is dominated by upland grass.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks)	Wetland Hydrology Indicators:
<input type="checkbox"/> Stream, Lake, or Tide Gauge	
<input checked="" type="checkbox"/> Aerial Photographs	<i>Primary Indicators:</i>
<input type="checkbox"/> Other	<input type="checkbox"/> Inundated
<input type="checkbox"/> No recorded data available	<input type="checkbox"/> Saturated in Upper 12 inches
Field Observations:	<input checked="" type="checkbox"/> Water Marks
Depth of Surface Water: _____ (In.)	<input type="checkbox"/> Drift Lines
Depth to Free Water in Pit: _____ (In.)	<input checked="" type="checkbox"/> Sediment Deposits
Depth to Saturated Soil: _____ (In.)	<input type="checkbox"/> Drainage Patters in Wetlands
	<i>Secondary Indicators (2 or more required):</i>
	<input type="checkbox"/> Oxidized Root Channels in Upper 12"
	<input type="checkbox"/> Water-Stained Leaves
	<input type="checkbox"/> Local Soil Survey Data
	<input type="checkbox"/> FAC-Neutral Test
	<input type="checkbox"/> Other (explain in remarks)
Remarks: Evidence of silt deposition and bent down foliage suggests that there had recently been flow up to 1.5 feet deep in the channel. Flow resulted from a storm event in a stream channel. General vicinity was sloped. Flow intermittent.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: Soil not tested, but mapped soil and casual observation indicated non-hydric soil.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Form used to document non-wetland waters' characteristics at this location.	

Form Content Approved by HQUSACE 3/92

Site 12—Waiawa Stream

Site Summary

Site 12—Waiawa Stream encompasses the stream and floodway of Waiawa Stream located between Kamehameha Highway, Farrington Highway, and the H-1 Freeway. In this area of Pearl City, Waiawa Stream is a perennial stream with natural bed and banks. The approximate location of Site 12 is 21°23'48.761"N latitude and 157°59'56.918"W (see the following Site 12 maps). The elevation of the stream invert below the Farrington Highway Bridge is approximately 12 feet.

During the on-site field surveys, no wetlands were identified; however, the perennial Waiawa Stream and associated floodplains were observed at Site 12 and existing conditions documented and recorded in the routine wetland determination data form (see the following Site 12 form). Based on the best available information and the on-site field surveys, Waiawa Stream is a perennial stream (RPW) that flows into Middle Loch, Pearl Harbor, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 17,400-acre Waiawa watershed drains from the Western slope of the Ko'olau Mountain Range ridgeline through both preservation and (largely fallow) agriculture lands above urban and light industrial areas of Pearl City. The USGS has maintained a flow gage (No. 16216000) approximately 1/4-mile below the Kamehameha Bridge (just above the H-1 Freeway) since 1952, monitoring flow from 16,640 acres of the watershed. Statistics from this site indicate that the mean daily flow from 1952 to 2004 averaged about 32 cfs with annual variations in daily average from about 7 to 80 cfs. Peak flows above 27,000 cfs were recorded on two occasions during the 52-year period, but average annual peak flows were typically above 10,000 cfs. The channel forming flow (daily mean flow that occurs about 2 out of 3 years) is approximately 1,700 cfs.

The site was visited on two occasions: 1-15-09 and 3-23-09, under clear skies as documented in the following photographs. Waiawa Stream in the project area combines flows from intermittent Pānakauahi Gulch and perennial Waiawa tributaries. Flow from the Pānakauahi Gulch joins Waiawa Stream less than 1/4 mile upstream of the Kamehameha Highway bridge. During the first field survey, the 1,800-foot reach was transited once from upstream to downstream and cross section measurements made of the stream channel. The stream bed and lower banks are, for the most part, natural, with a mean distance across the active stream bed of about 20 to 25 feet. Along this 1,800-foot reach, the stream bed falls 8.6 feet (from an elevation of 10.8 feet to 2.25 feet), equal to a slope of about 0.5 percent. During the second field survey, the OHWM was determined at approximately 8 feet above the stream bed by using various indicators, such as scour marks, bank shelving, water staining, and sediment deposition. The cross sectional flow area at OHWM below the Project crossing is approximately 450 and 531 square feet.

Floodplain beyond the bank appear to have been reduced by fill from adjacent properties, with the fill edge typically steeper than a 1:1 slope. Much of this fill appears to have been completed decades ago as large trees occur both on the side slopes and tops of these presumably filled areas. Below the upper Kamehameha Highway bridge, the stream appears to have been directed to the left by placement of a large boulder revetment on the right bank. The placement of the revetment and the alignment of the bridge pilings strongly suggests that the stream alignment used to be much more to the right (south) immediately below the Kamehameha Bridge. Possibly in response to this thalweg shift, approximately 350 feet downstream of the bridge, increased erosion on the left bank has threatened the stability of a large power pole, requiring the placement of concrete rubble reinforcement along the lower bank below the pole. Similarly, where the channel approaches the lower bridge—Farrington Highway—the stream parallels the bridge design opening, veering strongly to the right at the eastern (left bank) bridge support wall. The soft sandy soils on the land above the left bank (see Site 13 description) suggest that this bend has also been “engineered.”

The large majority of the stream riparian zone displays a healthy development of understory vegetation and a mature tree canopy.

Aquatic fauna within the stream was relatively diverse, including six species of fishes, a frog, and two species of crustaceans.

- Five Spot Cichlid, *Hemichromis elongatus*
- O’opu, gobie, *Eleotris sandwicensis*
- Tilapia, *Oreochromis sp*
- Mollies, *Poecilia sp*
- Mosquitofish, *Gambusia affinis*
- Armored catfish, *Hypostomus sp.*
- Crayfish, *Procambarus clarki*
- Prawn, *Macrobrachium lar*
- Frog and tadpole (species unidentified)

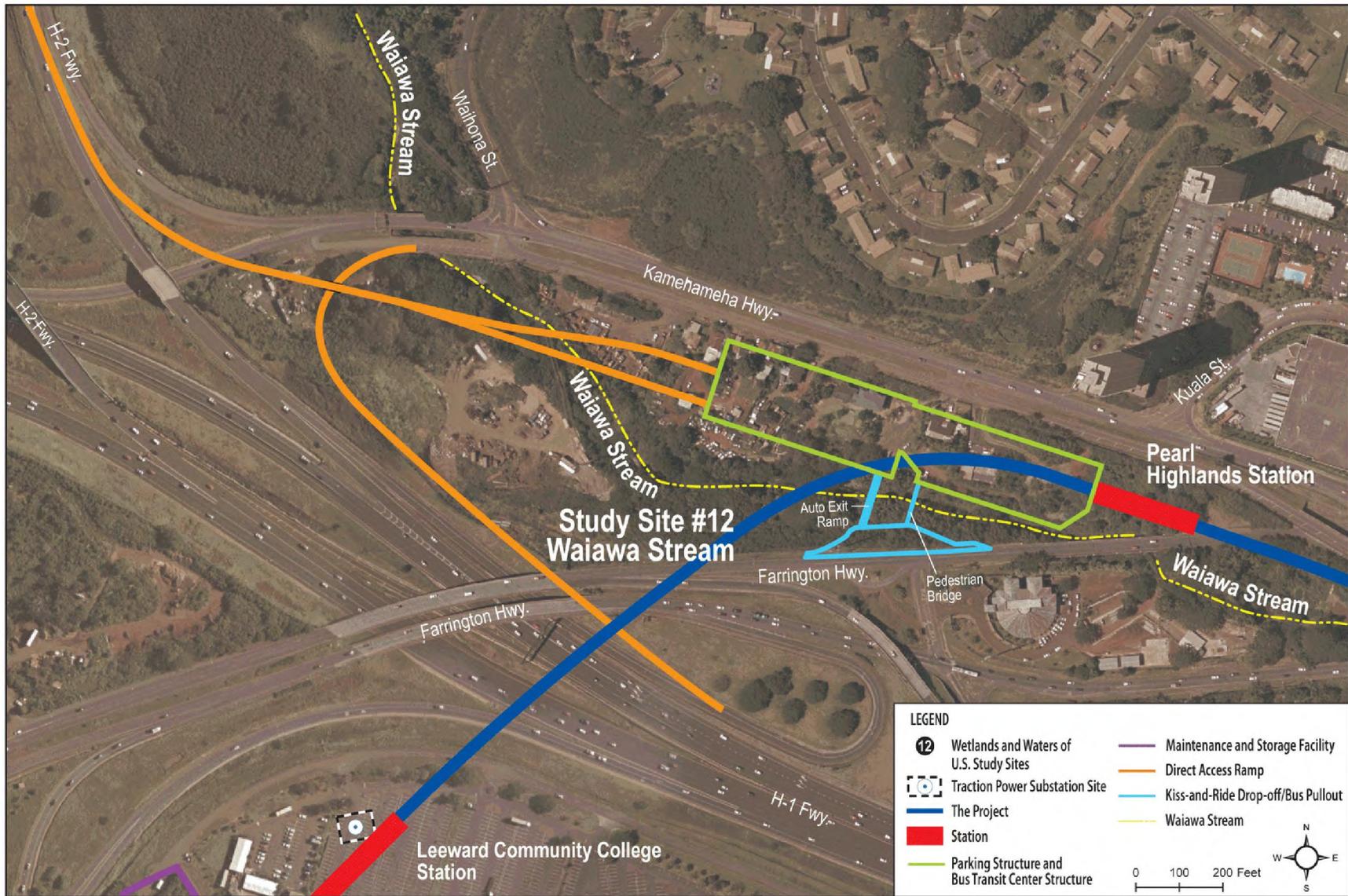
Potential Impacts

The Project would cross Waiawa Stream and the associated floodplains at Site 12 (see Appendix B). The potential impacts that may occur at Site 12 include the placement of fill material (i.e., pier columns and associated material) within the stream channel, shading, and clearing of adjacent vegetation. In addition, the removal of the previously placed fill material within the floodway areas may be necessary to accommodate the project design at this location.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 12A: View downstream from Kamehameha Highway bridge



Photo 12B: Eroded bank reinforced below power pole



Photo 12C: Typical riffle-pool complex near right-of-way crossing



Photo 12D: Downstream approach to Farrington Highway bridge



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 12. Waiawa Stream</u>	Date: <u>1/15/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>T. Koehler, T. Mulitauaoepele</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): < 1% within entire riparian zone

Remarks: _____

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>8-36</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>USGS Gage No. 16216000. Flowing stream with steep banks.</u>	

SOILS

Map Unit Name (Series and Phase): <u>Waipahu Silty Clay, Kawaihapai clay loam</u>	Drainage Class: <u>Well Drained</u> <i>Circle</i>				
Taxonomy (Subgroup): <u>Torrertic Haplustolls, Cumulic Haplustolls</u>	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol	<input type="checkbox"/> Reducing Conditions	<input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils			
<input type="checkbox"/> Histic Epipedon	<input type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Listed on National Hydric Soils List			
<input type="checkbox"/> Sulfidic Odor	<input type="checkbox"/> Concretions	<input type="checkbox"/> Listed on Local Hydric Soils List			
<input type="checkbox"/> Aquatic Moisture Regime	<input type="checkbox"/> Organic Streaking in Sandy Soils	<input type="checkbox"/> Other (explain in remarks)			
Remarks: <u>No samples. This is a stream with steep banks above the OHWM.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: <u>Form used to document non-wetland waters' characteristics at this location.</u>					

Form Content Approved by HQUSACE 3/92

Site 13—Waiawa Springs

Site Summary

Site 13—Waiawa Springs is a small, spring-fed tributary to Waiawa Stream located just upstream of the Farrington Highway (west bound) bridge at the eastern end of Site 12 in Pearl City. This tributary appears to flow perennially (i.e., is spring fed), although flow arises from a storm water drainage pipe serving the lower end of Kuala Street and passing under Kamehameha Highway (north bound). The approximate location of Site 13 is 21°23'47.697"N latitude and 157°58'48.063"W longitude (see the following Site 13 maps).

During the on-site field surveys, no wetlands were identified; however, the perennial Waiawa Springs was observed at Site 13. The existing conditions at Site 13 were documented and recorded in the routine wetland determination data form (see the following Site 13 form). Based on the best available information and the on-site field surveys, Waiawa Springs is a perennially (RPW) flowing tributary to Waiawa Stream (see Site 12), also an RPW. Flows from the Waiawa Stream (Site 12) eventually discharge into the Middle Loch, Pearl Harbor, which is connected to the Pacific Ocean (TNW). The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 17,400-acre Waiawa watershed drains from the Western slope of the Ko'olau Mountain Range through preservation and (now largely fallow) agriculture lands east of the H-2 Freeway. The USGS has maintained a flow gage (No. 16216000) approximately 1/4-mile below the Kamehameha Highway bridge (just upstream of the H-1 viaduct) since 1952 monitoring flow from 16,640 acres of the watershed. Statistics from this site indicate that the mean daily flow from 1952 to 2004 averaged about 32 cfs with annual variations in daily average from about 7 to 80 cfs. Peak flows above 27,000 cfs were reached on two occasions during the 52-year period with average annual peak flows typically above 10,000 cfs. The channel forming flow (flow that occurs on a frequency of 2 out of 3 years) is approximately 1,700 cfs.

The site was visited on three occasions, 1-15-09, 3-23-09, and 06-29-09, all under clear skies as documented in the following photographs. A small tributary emerges in a pool at the foot of the bank adjacent to Kamehameha Highway, opposite to the intersection with Kuala Street. The small stream flows south about 150 feet through a 3- to 5-foot-wide channel incised up to 6 feet through soil to a confluence with Waiawa Stream a short distance upstream of the Farrington Highway (west bound) bridge. Storm drains serving the lower end of Kuala Street empty via a 36-inch drain pipe in a pool that is the source of the observed flows. Since this flow appears to be perennial, it is thought that the storm water system is fed by a spring upslope of the outlet.

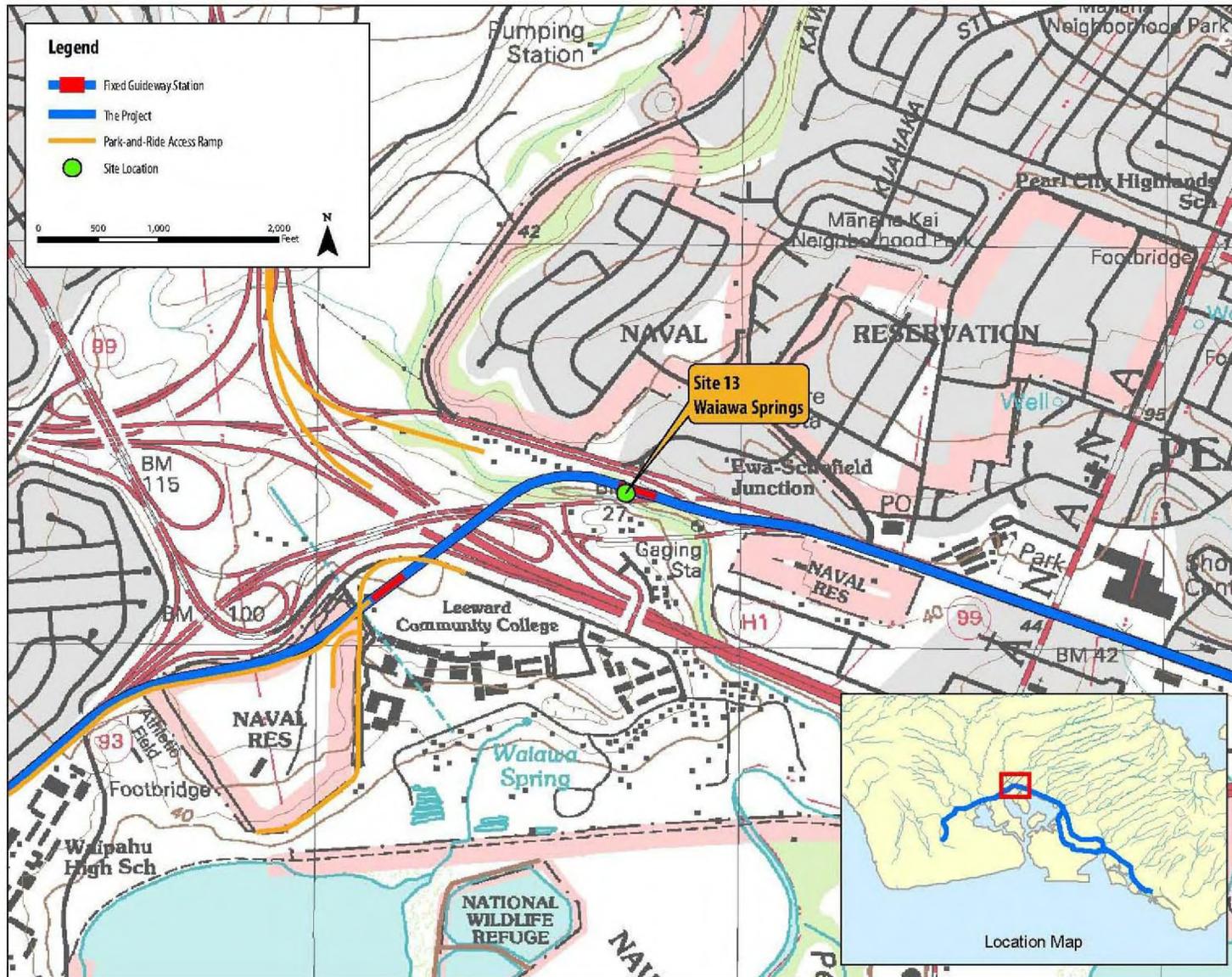
During the second site visit, two test pits were dug to analyze the soil. No ground water was observed in the soil pits that were dug to a depth of 18 inches. The soil did not exhibit any primary or secondary characteristics of a hydric soil. The soil was sandy.

Frogs and tadpoles(*Rana catesbeiana*) were noted within the spring.

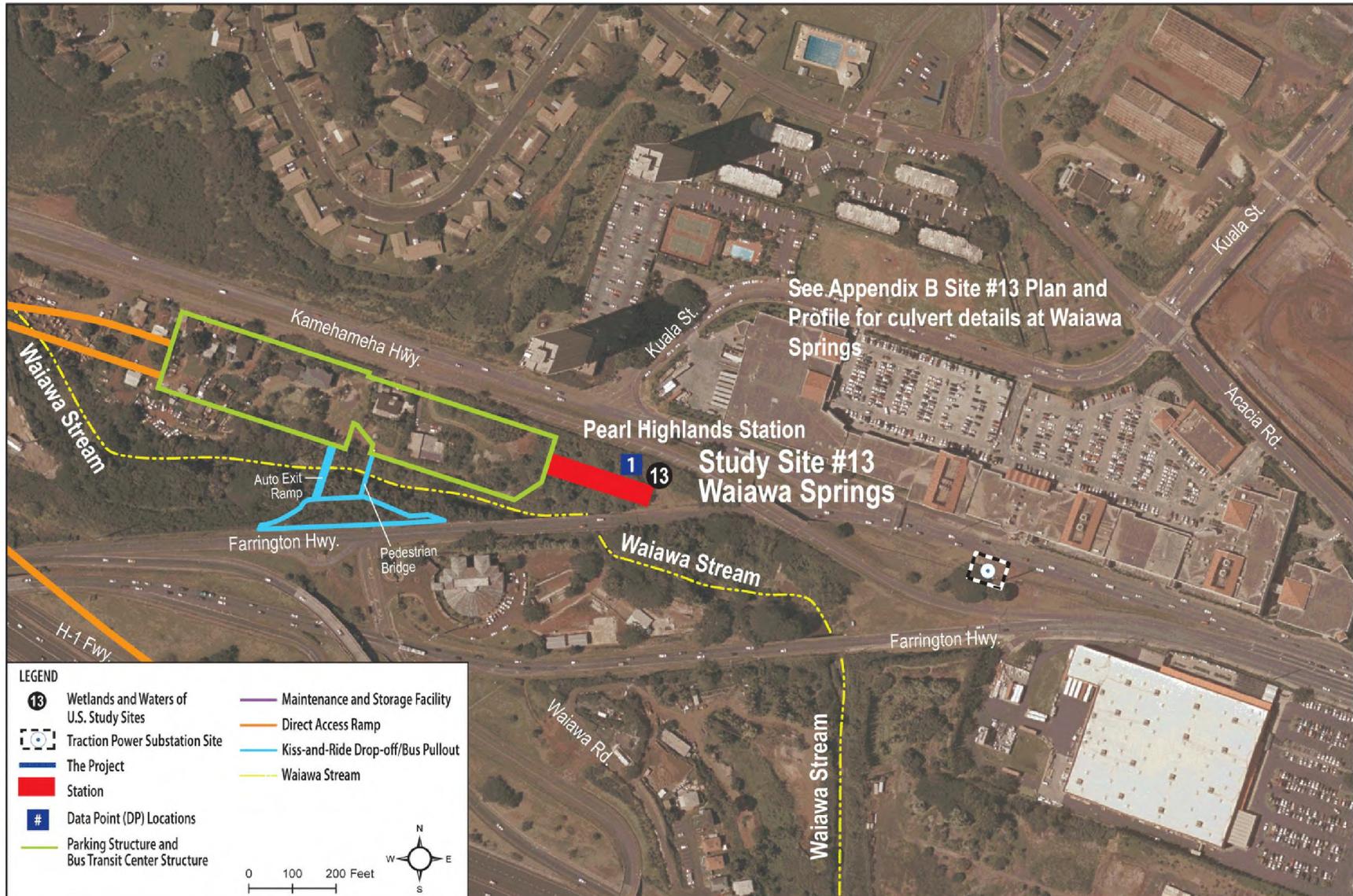
Potential Impacts

The Pearl Highlands Station is proposed at Site 13, which may result in impacts to Waiawa Springs from piers supporting the parking structure and bus transit structure. Potential impacts that may occur also include the placement of fill material (i.e., pier columns and associated material) within the spring channel, shading, and clearing of adjacent vegetation. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 13A: Entry point of tributary to Waiawa Stream above Farrington Highway bridge



Photo 13B: Thick stand of castor bean plants on site



Photo 13C: Digging soil pit for wetland investigation



Photo 13D: Spring upwelling point at base of Kamehameha Highway fill slope



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 13. Waiawa Spring</u>	Date: <u>7/6/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>E. Guinther</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP# 1</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <u>Ricinus communis</u>	SHRUB	FACU	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks: Recent (4 month previous) inundation of area by a Waiawa Stream freshet may have disturbed vegetation which is now a monotypic stand of castor bean (dominant) and several vines (rooted outside of the survey site).

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input checked="" type="checkbox"/> Other <u>City drainage plan</u> <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: Primary Indicators: <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands	Secondary Indicators (2 or more required): <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: <u>0</u> (In.) Depth to Free Water in Pit: <u>> 18</u> (In.) Depth to Saturated Soil: <u>> 18</u> (In.)	Remarks: <u>Study Site appeared initially to be a spring with a short (~100 ft) run to Waiawa Stream. Subsequent investigation shows it to be arising from the terminus of a 36" highway drain line. Continued flow (observed again on 06-29-09 and 7-6-09) indicates culvert may be transferring spring water to a small tributary of Waiawa Stream. Flow is likely perennial.</u>	

SOILS

Map Unit Name (Series and Phase): <u>Kawaihapai clay loam (KIA)</u>	Drainage Class: <u>Well drained</u> Circle				
Taxonomy (Subgroup): <u>Cumulic Haplustolls (Mollisols)</u>	Field Observations Confirm Mapped Type? Yes No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0 - 17		7.5YR 2.5/2	7.5YR 4/6	marbling distinct 0-10 in	Sandy loam
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: <u>Soil pit dug about 8 feet from flowing water. On inspection at 60X magnification, the upper soil layer appears to have a high organic content (small plant and insect bits) with thin brown (brighter when dry) marbling throughout. Possibly represents material deposited over time from Waiawa Stream freshets that reach this shelf behind top of bank line (i.e., flood plain). 21.396655 N Latitude, 157.979409 W Longitude</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Remarks: <u>Incised drainage channel and well drained soils appear to dry adjacent areas out following rains or floods.</u>	

Form Content Approved by HQUSACE 3/92

Site 24—Moanalua Stream (Mauka-Salt Lake)

Site Summary

Site 24—Moanalua Stream (Mauka-Salt Lake) is located along the estuary of Moanalua Stream between Kikowaena Street and Nimitz Highway in Māpunapuna, Honolulu. The estuary is confined within a broad man-made channel with mostly graded banks. The project area is a tidal estuary that flows into the upper end of Ke‘ehi Lagoon. The approximate location of Site 24 is 21°20'34.000"N latitude and 157°53'37.211"W longitude (see the following Site 24 maps).

During the on-site field surveys, the perennial flowing Moanalua Stream was observed within a modified channel and the existing conditions were documented and recorded in the routine determination data form (see the following Site 24 form). Based on the best available information and the on-site field surveys, Moanalua Stream (RPW) is joined by Manaiki Stream becoming an estuary in a man-made channel. The estuary flows to Ke‘ehi Lagoon, a TNW and coastal embayment of the Pacific Ocean. Mangroves were observed along portions of the channel banks that consist primarily of rock revetment. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 6,778-acre Moanalua watershed drains from two parallel valleys up to the top of the Ko‘olau Mountain Range through major urban and light industrial areas of Māpunapuna to Ke‘ehi Lagoon. The stream is joined by Manaiki Stream upstream of the H-1 Freeway within Moanalua Gardens.

The site was visited on 3-26-09 at 12:15 p.m. under clear no-rainfall conditions as documented in the following photographs. This realigned channel extends from the H-1 Freeway bridge to the junction with Kahauiki Stream above Nimitz Highway. The proposed Salt Lake alignment will cross over the channel at this location from Māpunapuna to Fort Shafter Flats.

The canal is a 100-foot-wide trapezoidal channel dredged to below sea level, with sloped concrete or concrete-rock masonry (crm) sidewalls extending 3 to 5 feet above the water. Some sections of the channel do not have concrete sidewalls. The right (west) bank of the stream abuts the Māpunapuna industrial district, and the left (east) bank runs along the Fort Shafter Flats. . At the site, it was observed that the water level at the time of observation (3-26-09 at 12.20 p.m.) was 2.0 feet below the OHWM as judged by stains on the sidewalls and leaf litter deposits. Comparing the water level at the time with the Honolulu tide gage reading of 0.33 feet below MSL provides an estimate of the OHWM of 1.67 feet above MSL.

Vegetation along the margins of the channel is dominated by mangrove with some areas of Indian fleabane on the banks. There was no soft sediment buildup on the right bank where most of the mangrove trees are relatively small. On the left bank, many of the mangroves

have grown to heights exceeding 20 feet with aerial roots extending 5 to 10 feet out into the channel.

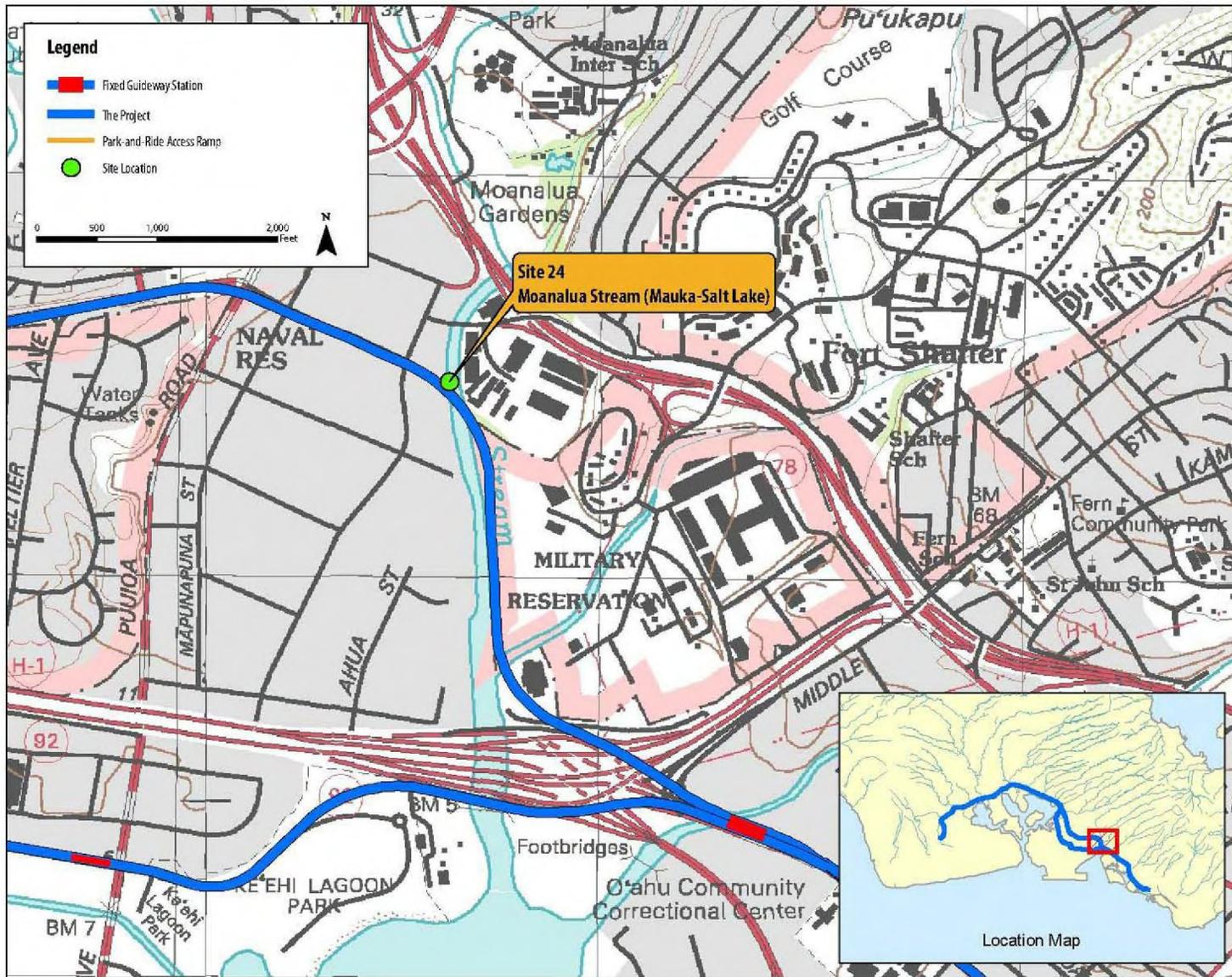
The USGS has records for two gages on Moanalua Stream. The closest gage (No. 16228200) is relatively distant from the project site at an elevation of 230 feet and only encompasses flow from about one-third of the watershed area. A maximum peak flow at the gage over the 9 years of record (1969–1978) was about 4,800 cfs, with half of the annual peak flows above 1,000 cfs. The average annual daily flow varied from 0.6 to 14.7 cfs, with a mean flow of 5.0 cfs. As a rough estimate, these flow rates should probably be doubled to approximate flows at the project site.

The water had a refractometer-measured salinity of 27 ppt. The water was sufficiently clear to see the bottom at a depth of 1 foot, but not deeper. Miscellaneous trash was noted to have accumulated at the high-tide line. Although no waterfowl were noted, this area might offer foraging areas for the Hawaiian Stilt and possibly Hawaiian Coot.

Potential Impacts

Site 24 is located along the Salt Lake alignment, which was not selected as the preferred alignment. Therefore, no impacts to waters of the U.S. would occur at this location.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 24A: Downstream right embankment at proposed bridge site



Photo 24B: Mangroves on both embankments



Photo 24C: Vegetation along stream bank



Photo 24D: Upstream view of left embankment showing ordinary high-water mark



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 24. Moanalua Stream (Mauka-Airport)</u>	Date: <u>3/26/2009</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>	State: <u>HI</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Rhizophora mangle</i>	Tree	OBL	8		
2 <i>Pluchea spp</i>	Shrub	FAC	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Mangroves mostly rooted on channel margins (often rock revetment) and overhanging branches drop aerial roots into open water.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>24</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>USGS Gage No. 16228200. Ground beyond banks is developed.</u>	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____ Circle				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: <u>No sample taken; bank soils appear to be fill material or is rock revetment.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: <u>This is a channelized stream subject to the ebb and flow of tides from Honolulu Harbor. Wetland areas present (mangal) , but estuary is within the OHWM.</u>					

Form Content Approved by HQUSACE 3/92

Site 27—Moanalua Stream (Makai-Airport)

Site Summary

Site 27—Moanalua Stream is located in the lower estuary of Moanalua Stream directly south of North Nimitz Highway and the H-1 Freeway viaduct in Māpunapuna, Honolulu. The tidal estuary at the site opens a short distance downstream into Ke‘ehi Lagoon. The approximate location of Site 27 is 21°19’59.467”N latitude and 157°53’37.211”W longitude (see the following Site 27 maps).

During the on-site field surveys, the Moanalua Stream and associated mangrove wetlands were observed at this location. The existing conditions were documented and recorded in the routine wetland determination data form (see the following Site 27 form). Based on the best available information and the on-site field surveys, the Moanalua Stream is an RPW with associated tidal mangrove wetlands that is connected to Ke‘ehi Lagoon (TNW), an embayment of the Pacific Ocean.

Site Description

The 6,778-acre Moanalua watershed drains from two parallel valleys up to the top of the Ko‘olau Mountain Range through major urban and light industrial areas of Māpunapuna to the Ke‘ehi Lagoon section of Honolulu Harbor. The stream is joined by Manaiki Stream up above the H-1 Freeway in the Moanalua Gardens and by Kahauiki Stream in Fort Shafter Flats.

The site was visited on 3-26-09 at 1:30 p.m. under clear no-rainfall conditions as documented in the following photographs. This reach extends from Nimitz Highway immediately adjacent upstream, to the Ke‘ehi Lagoon portion of Honolulu Harbor, 600 feet downstream.

The canal was measured at 249 feet wide along the foot bridge, which crosses the channel at about a 30-degree angle. The actual channel width is about 230 feet. Both banks are covered with a monoculture of 20- to 30-foot-tall mangrove trees with aerial roots and trunks extending 5 to 10 feet out into the channel. The site is subject to tidal flow. At the time of observation (1:40 p.m.), the tide height was at 0.17 foot (MSL), as measured on the Honolulu Harbor tide gage. At the site, the water level was measured at 0.23-foot elevation with the ordinary high-water mark corresponding to stain marks on concrete pilings at an elevation of 1.68 feet, slightly above the normal higher high-tide elevation. The slope of the water surface is zero, as this is the final estuarine reach of the stream before it joins with Ke‘ehi Lagoon in Honolulu Harbor. The channel averaged 3.1 feet deep with a maximum depth of 5.24 feet.

Riparian vegetation is dominated by mature mangrove. Sediment buildup beneath the canopy has extended the low-tide shoreline into the channel by as much as 10 feet in places. Sediment below the overlay of leaf (and trash) liter is black, has a “rotten egg” odor, and is saturated by daily tides.

Although no waterfowl were noted, this type of habitat likely offers foraging areas for the Hawaiian Stilt and possibly Hawaiian Coots. A local fisherman who frequents this site

commented that tilapia, mullet, barracuda, and aholehole were often caught from the pedestrian bridge. It is likely that lai (*Scoberoides lysan*) also frequent this site.

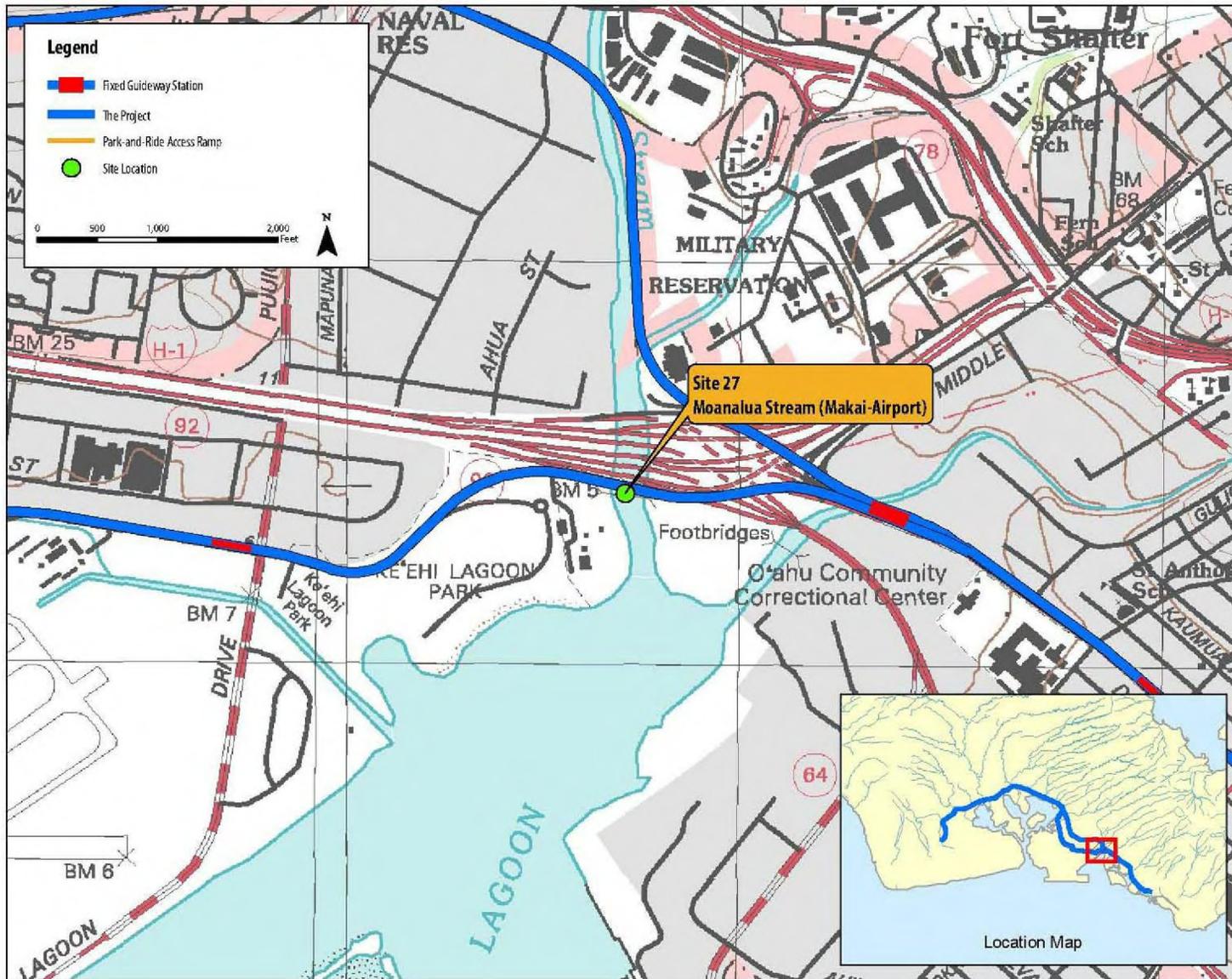
The USGS has records for two gages on Moanalua Stream. The closest gage (No. 16228200) is relatively distant from the project site at an elevation of 230 feet and only encompasses flow from about one-third of the watershed area. A maximum peak flow at the gage over the 9-year period of record (1969–1978) was about 4,800 cfs with half of the annual peak flows above 1,000 cfs. The average annual daily flow varied from 0.6 to 14.7 cfs with a mean flow of 5.0 cfs. As a first estimate, these flow rates should probably be doubled to approximate the flow at the project site.

The water had a refractometer-measured salinity of 31 ppt. The water was sufficiently clear to see the bottom at a depth of 1 foot, but not deeper. Miscellaneous trash was noted to have accumulated at the high-tide line within the mangrove.

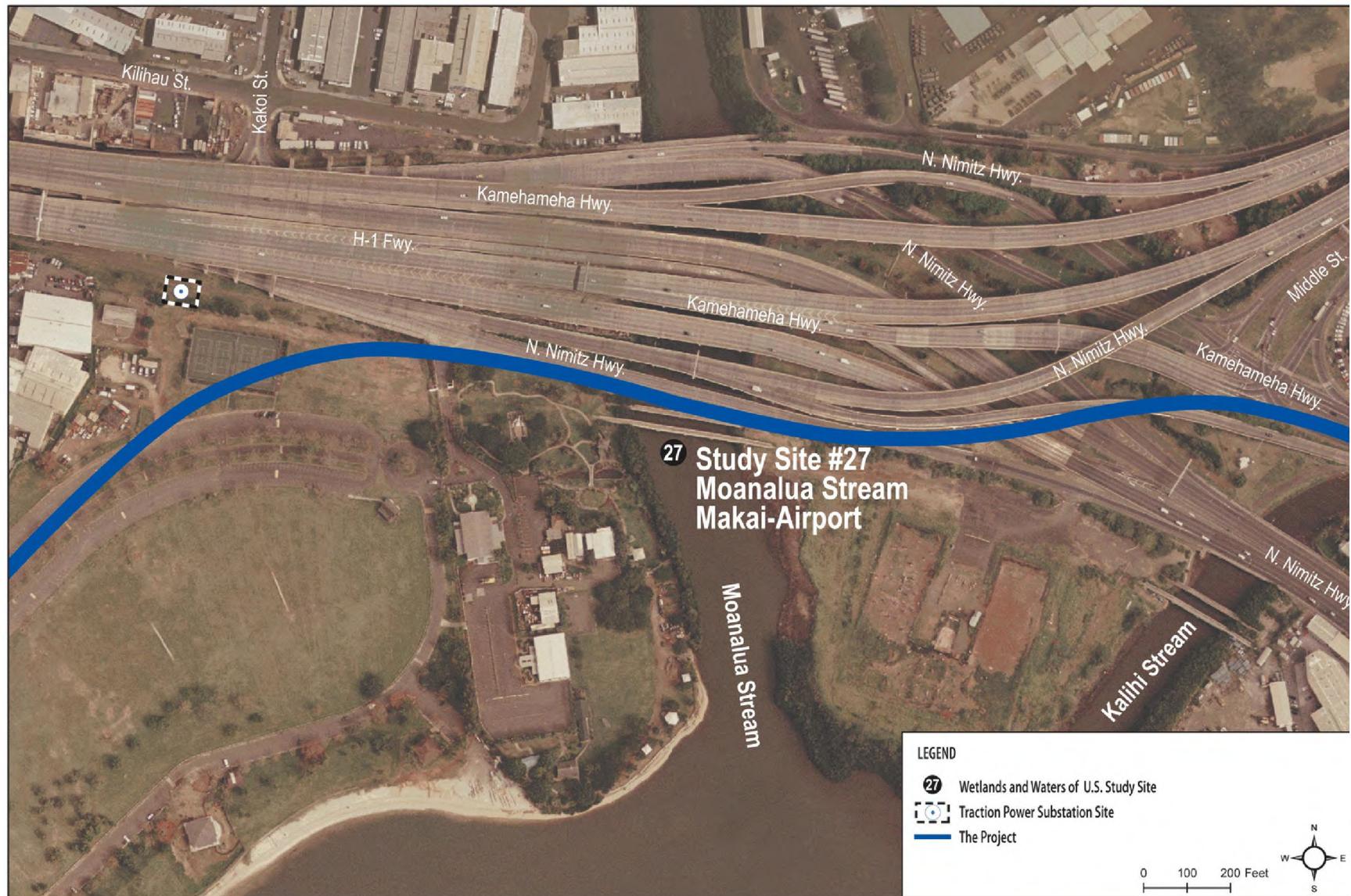
Potential Impacts

The Project would cross Moanalua Stream and associated mangrove wetlands at Site 27 (see Appendix B). The potential impacts that may occur at Site 27 include the placement of fill material (i.e., guideway support columns and associated material) within the stream channel, shading, and clearing of adjacent vegetation.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 27A: View to the east along right-of-way

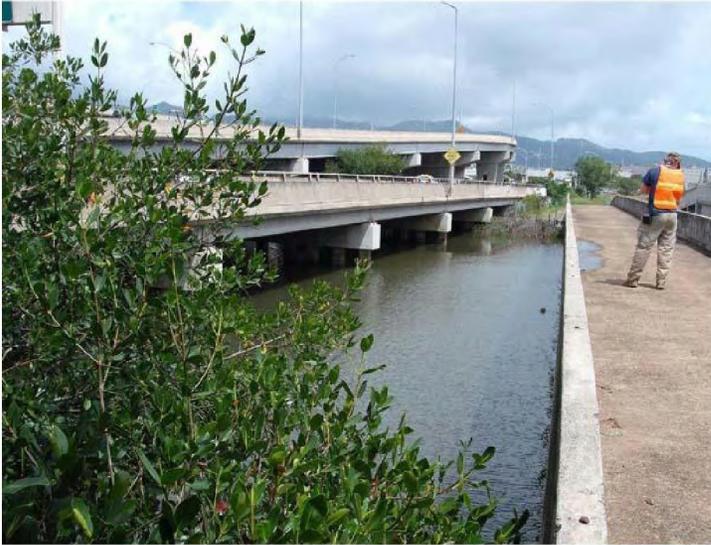


Photo 27B: Downstream view of adjacent pedestrian bridge



Photo 27C: Trash accumulated on banks in mangrove



Photo 27D: Downstream view to Ke'ehi Lagoon



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 27.Moanalua Stream (Makai-Airport)	Date: 3/26/09
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 <i>Rhizophora mangle</i>	Tree	OBL	8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input checked="" type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patterns in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: 37 (in.) Depth to Free Water in Pit: _____ (in.) Depth to Saturated Soil: _____ (in.)	Remarks: USGS Gage No. 16228200 and Honolulu Harbor tide gage Site is a tidal estuary.

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil sample taken.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: This is a channelized stream subject to the ebb and flow of tides from Honolulu Harbor. Wetland areas present (mangal), but estuary is within the OHWM.					

Form Content Approved by HQUSACE 3/92

Site 29—Kapālama Canal Stream

Site Summary

Site 29—Kapālama Canal Stream is located on Dillingham Boulevard at the bridge spanning Kapālama Canal. Kapālama Canal Stream, at this location, is a realigned channel with graded soil banks, estuarine (tidal), and receiving flow from Kapālama Stream as well as runoff from the urban Kalihi and Kamehameha Heights. The approximate location of Site 29 is 21°19'19.000"N latitude and 157°52'23.000"W longitude (see the following Site 29 maps).

During the on-site field surveys, Kapālama Canal Stream and the existing conditions were documented and recorded in the routine determination data form (see the following Site 29 form). Based on the best available information and the on-site field surveys, Kapālama Canal is a man-made TNW opening into Honolulu Harbor, a TNW connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 2,141-acre Kapālama watershed drains from the Ko'olau Mountain Range through urban and light industrial areas of Honolulu to Honolulu Harbor.

The site was visited on 2-9-09 at 10:48 a.m. under clear no-rainfall conditions as documented in the following photographs. The bottom of the canal averaged 2.5 feet deep at a tide height of -0.92 foot above MSL. This site is tidal, so the OHWM used is the mean higher high-tide elevation of 1.08 feet above MSL, which corresponds to a water depth of 3.58 feet above the bed at the bridge. Several features indicating the OHWM were observed that included clear line impressed (stain) on bridge pier pilings and bank sidewalls upstream and downstream of bridge, presence of wrack above OHWM, change in the slope of the dirt banks above the OHWM, absence of salt tolerant plants below the OHWM..

The canal is 111 feet wide between eroded earthen banks along a relatively straight run from the King Street Bridge, 1,700 feet mauka to the Nimitz Highway bridge and Honolulu Harbor, 1,500 feet makai. Bank slopes average greater than a 1:1 slope up to a street elevation estimated at 6 feet above MSL. The banks are vegetated above the high-tide line with grasses and small shrubs apparently controlled by physical means as well as application of herbicide.

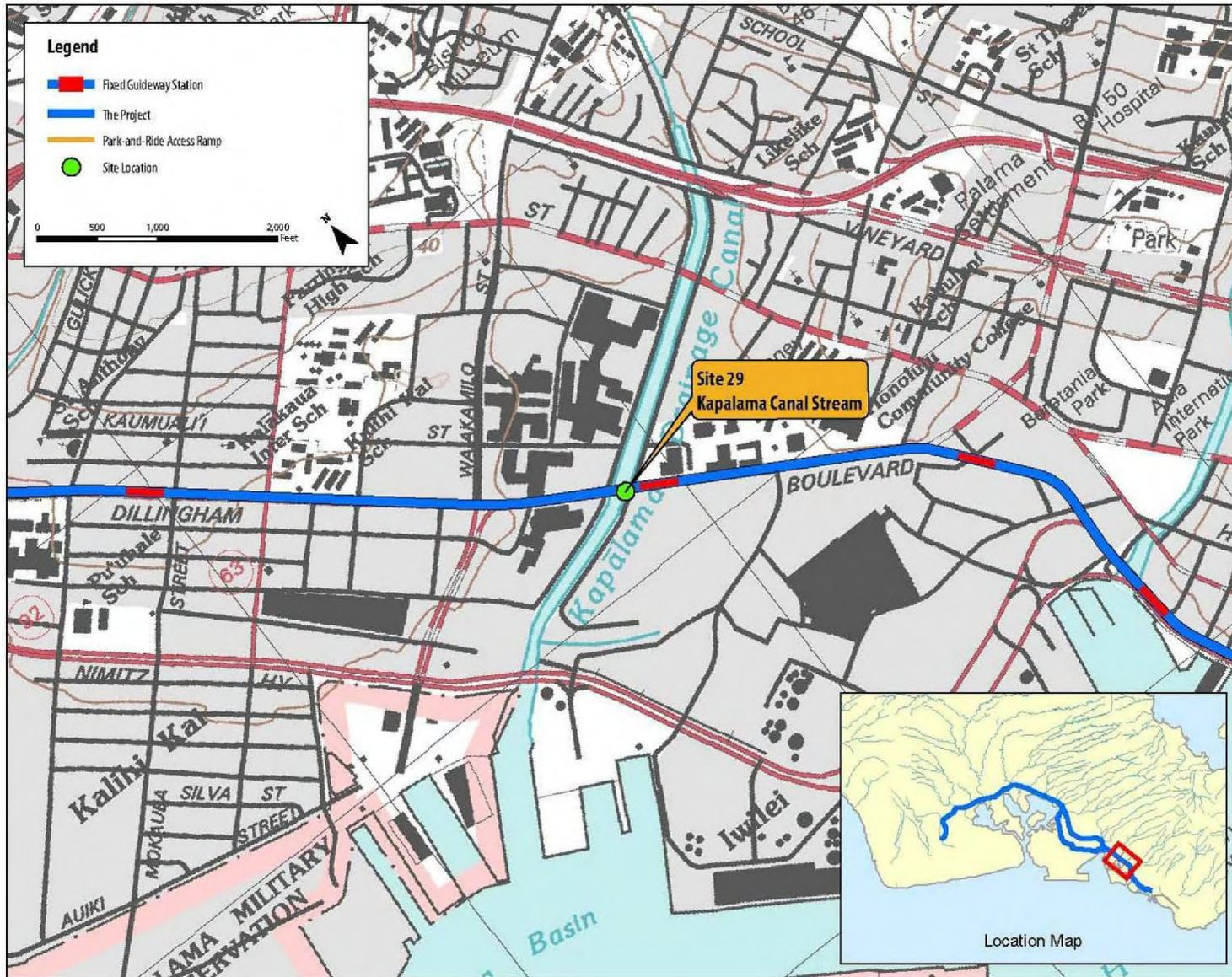
Near the high-tide line, several small mangroves were rooting and a salt-tolerant succulent (akulikuli or *Sesuvium portulacastrum*) and *Pluchia indica* were noted. In addition to the ever-present tilapia, several lai (*Scomberoides lysan*) and mullet (*Mugil sp*) were observed. Although no waterfowl were noted, this type of habitat possibly could offer foraging areas for the Hawaiian Stilt and possibly Hawaiian Coot.

The water had a refractometer-measured salinity of 22 ppt and was sufficiently clear to see the bottom at a depth of 2 feet, but no deeper. Miscellaneous trash was noted to have accumulated at the high-tide line.

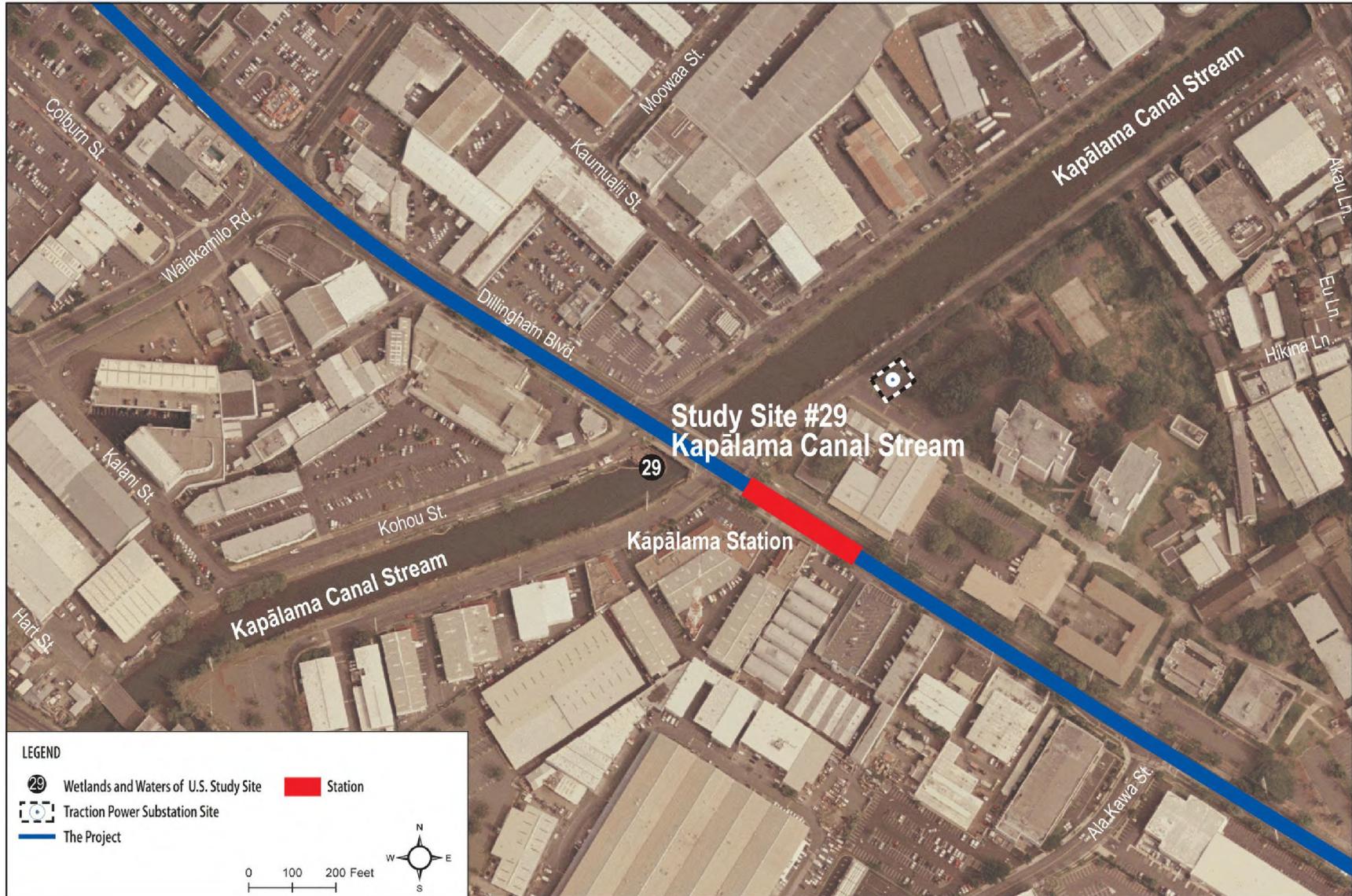
Potential Impacts

The Project would cross Kapālama Canal Stream at Site 29 and may result in potential impacts, such as the placement of fill material (i.e., extending guideway support columns and associated material) within the stream channel, shading, and/or clearing of adjacent vegetation. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 29A: Upstream right embankment showing erosion and vegetation line at high-tide elevation



Photo 29B: Upstream left embankment



Photo 29C: Downstream left embankment



Photo 29D: Downstream right embankment



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: Honolulu Rapid Transit/ Site 29.Kapalama Canal Stream	Date: 2/9/09
Applicant/Owner: City and County of Honolulu	County: Honolulu
Investigator: R. Bourke, T. Koehler	State: HI
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: DP#

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 Rhizophora mangle	SHRUB	OBL	8		
2 Pluchea spp	SHRUB	FAC	9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Scattered mangrove shrubs present.

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input checked="" type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Field Observations: Depth of Surface Water: 22 (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	
Remarks: Tidal channel with steep banks short riparian zone giving way to paved surfaces.	

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Concretions <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Other (explain in remarks)					
Remarks: No soil sample examined.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Is this Sampling Point Within a Wetland? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Wetland Hydrology Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hydric Soils Present? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Remarks: Form used to document non-wetland waters' characteristics for this location.	

Form Content Approved by HQUSACE 3/92

Site 30—Nu‘uanu Stream

Site Location

Site 30—Nu‘uanu Stream is located on North Nimitz Highway at River Street where the highway crosses the canal of Nu‘uanu Stream in downtown Honolulu. Nu‘uanu Stream at this location is a tidal estuary confined to a man-made channel, emptying into Honolulu Harbor at the study site. The approximate location of Site 30 is 21°18'48.000"N latitude and 157°51'54.000"W longitude (see the following Site 30 maps).

During the on-site field surveys, the Nu‘uanu Stream was observed within a man-made channel and the existing conditions were documented and recorded in the routine determination data form (see the following Site 30 form). Based on the best available information and the on-site field surveys, Nu‘uanu Stream, at this location is a TNW opening into Honolulu Harbor, also a TNW, connected to the Pacific Ocean. The following paragraphs describe the site conditions observed during the field surveys and the potential impacts that may occur as a result of the Project.

Site Description

The 6,558-acre Nu‘uanu watershed is a first-order stream receiving minor perennial inflow from Waolani Stream just above the H-1 Freeway. The Nu‘uanu Valley has long been a major population center for O‘ahu, and the stream has at least four dam flow control structures upstream which help to moderate the flow of the stream, although the stream does flow in a more or less natural bed until it reaches the H-1 Freeway.

The site was visited on 3-18-09 at 10:20 a.m. under clear no-rainfall conditions as documented in the following photographs. Twin bridges of Nimitz Highway span the 110-foot-wide canal with the proposed right-of-way alignment to pass between the spans. Upstream of the highway bridges, the stream is contained within the vertical, concrete-sided channel 240 feet upstream to the North King Street Bridge. On a falling tide with a recorded height of -0.08 foot above MSL, the channel averaged only 2.7 feet deep beneath the mauka bridge with a maximum depth of 3.6 feet and was flowing out at a speed of 0.66 foot per second. The measured OHWM was 1.23 feet above MSL (approximately 3.23 feet up from the channel bed). A better estimate of the OHWM elevation would be 1.08 feet above MSL (approximately 3.08 feet up from the channel bed) corresponding to the harbor tide gage MHHW since this site is hydrologically within Honolulu Harbor.

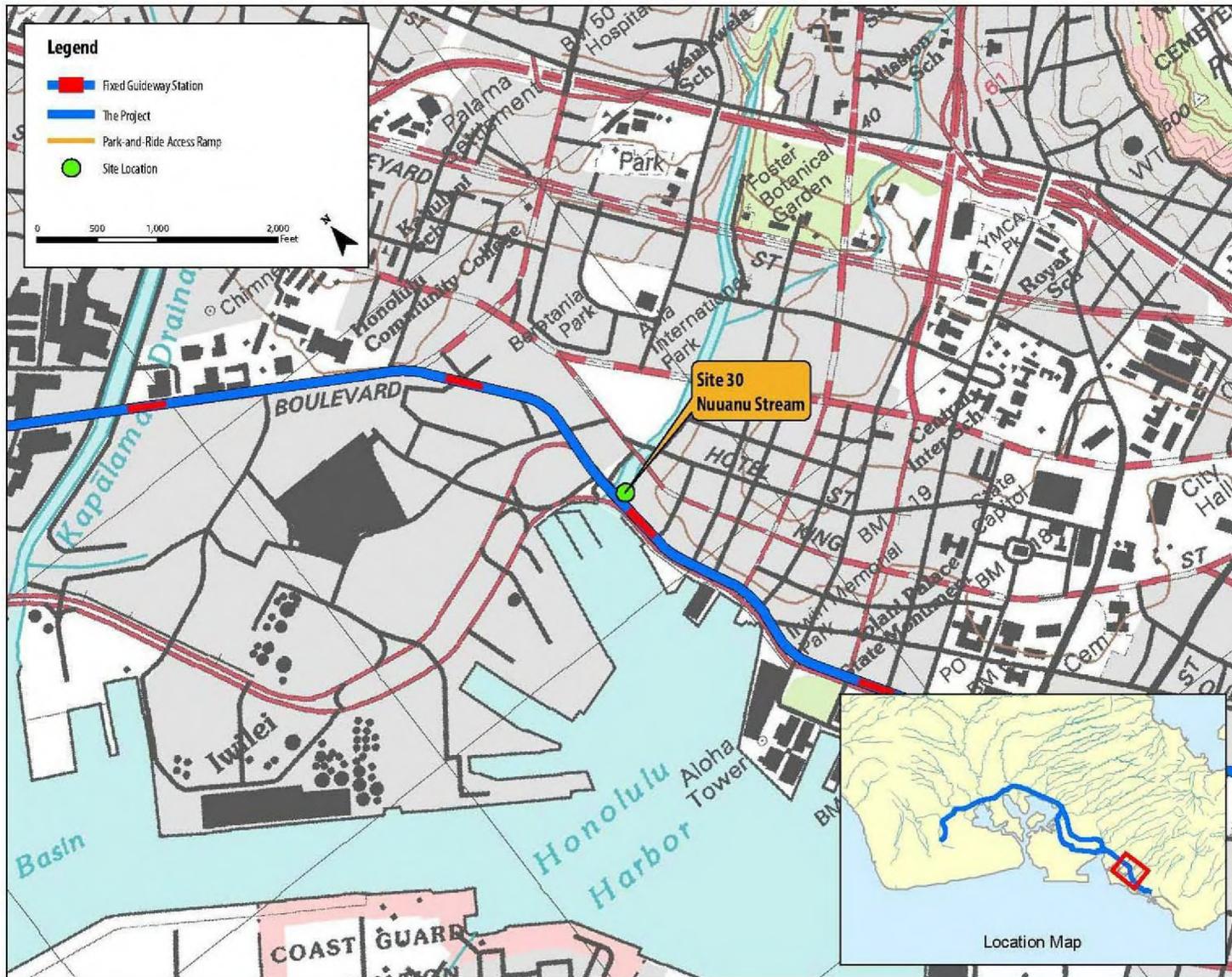
The USGS has maintained a gage (No. 16232000) on this stream, just below three reservoirs, at an elevation of 640 feet, since 1908. Prior to 1930, there were two peak flow events of 7,000 cfs and nearly 5,000 cfs, but since 1930, peak flows have never exceeded 3,000 cfs. The average annual peak flow is just under 1,000 cfs. The annual average daily flow has varied from 1.5 to 20 cfs with an average of about 6.2 cfs. Over the period 1986–1996, the channel forming flow—the average daily flow exceeded every 1.5 years—was about 132 cfs. As the above numbers are estimates from only the upper half of the watershed, the estimated flows at the project site would be significantly greater.

There were no wetland plants growing within the channel. Above the vertical walls of the channel, vegetation was dominated by planted and cultured plants. Tilapia were the most abundant fish seen, although mullet and a single barracuda were noted. Salinity was measured with a refractometer at 17 ppt.

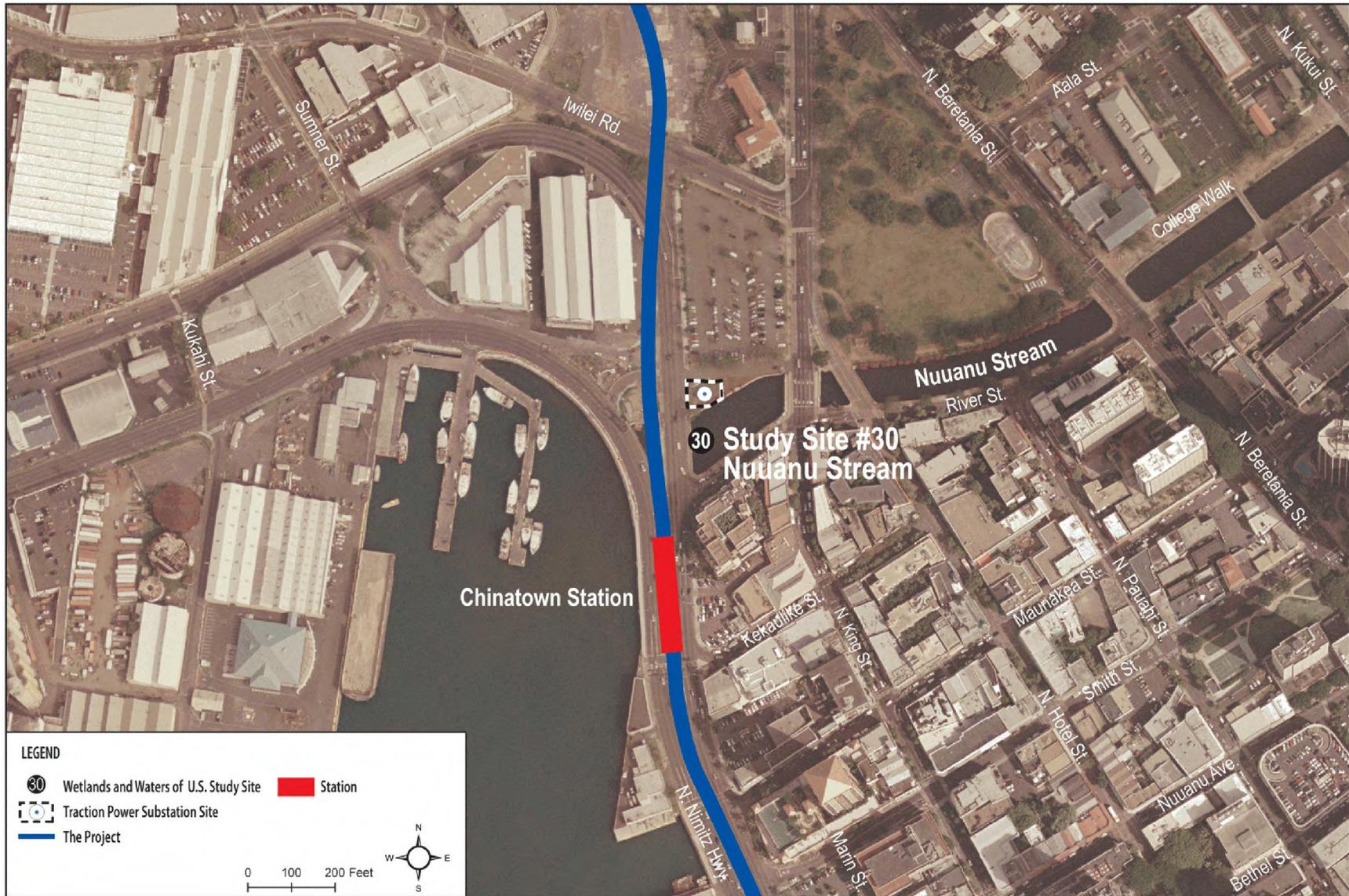
Potential Impacts

The Project would cross Nuʻuanu Stream at Site 30 (see Appendix B). The potential impacts that may occur at Site 30 include the placement of fill material (i.e., guideway support columns and associated material) within the stream channel, shading, and clearing of adjacent vegetation. Potential impacts to waters of the U.S. will be discussed in the Final EIS and as part of the Section 404/10 permit process.

USGS Topographic Map



Aerial Site Map



Site Photographs

Photo 30A: Mauka bridge facing west along right-of-way alignment



Photo 30B: Mauka bridge facing east



Photo 30C: Downstream right embankment showing high-tide line near top of drain opening



Photo 30D: Upstream view of mauka bridge



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site: <u>Honolulu Rapid Transit/ Site 30.Nuuanu Stream</u>	Date: <u>3/18/09</u>
Applicant/Owner: <u>City and County of Honolulu</u>	County: <u>Honolulu</u>
Investigator: <u>R. Bourke, T. Koehler</u>	State: <u>Hawaii</u>
Do Normal Circumstances exist on the site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Community ID: _____
Is the site significantly disturbed (Atypical Situation)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Transect ID: _____
Is Area a Potential Problem Area? (if needed, explain on reverse) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Plot ID: <u>DP#</u>

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7			14		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): _____

Remarks: No vegetation present; concrete lined drainage canal (estuarine).

HYDROLOGY

<input checked="" type="checkbox"/> Recorded Data (describe in Remarks) <input checked="" type="checkbox"/> Stream, Lake, or Tide Gauge <input checked="" type="checkbox"/> Aerial Photographs <input type="checkbox"/> Other <input type="checkbox"/> No recorded data available Field Observations: Depth of Surface Water: <u>48</u> (In.) Depth to Free Water in Pit: _____ (In.) Depth to Saturated Soil: _____ (In.)	Wetland Hydrology Indicators: <i>Primary Indicators:</i> <input checked="" type="checkbox"/> Inundated <input type="checkbox"/> Saturated in Upper 12 inches <input checked="" type="checkbox"/> Water Marks <input type="checkbox"/> Drift Lines <input type="checkbox"/> Sediment Deposits <input type="checkbox"/> Drainage Patters in Wetlands <i>Secondary Indicators (2 or more required):</i> <input type="checkbox"/> Oxidized Root Channels in Upper 12" <input type="checkbox"/> Water-Stained Leaves <input type="checkbox"/> Local Soil Survey Data <input type="checkbox"/> FAC-Neutral Test <input type="checkbox"/> Other (explain in remarks)
Remarks: <u>USGS Gage No. 1623200 and Honolulu Harbor tide gage. Tidal canal between vertical concrete walls at stream mouth in Honolulu Harbor.</u>	

SOILS

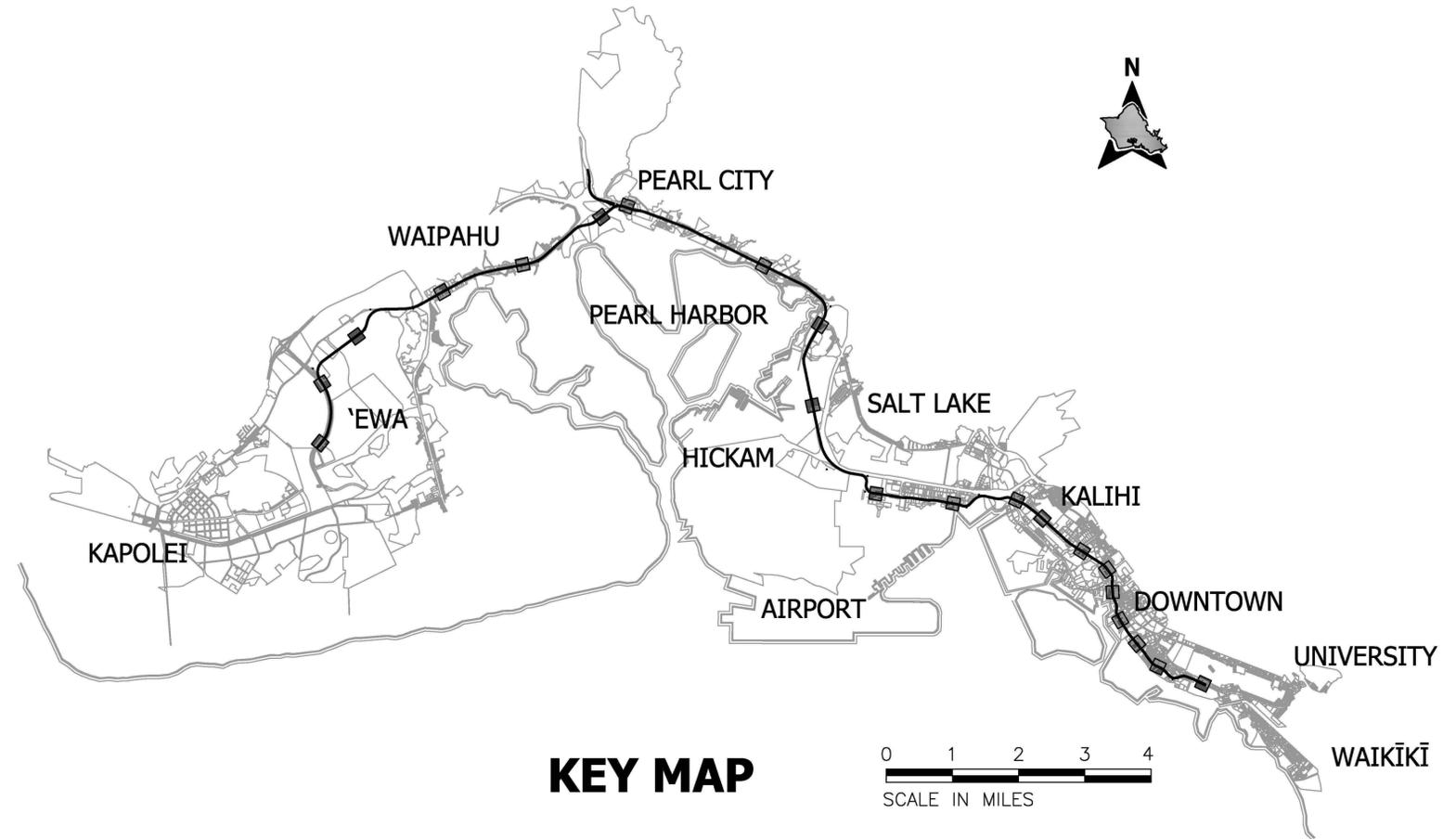
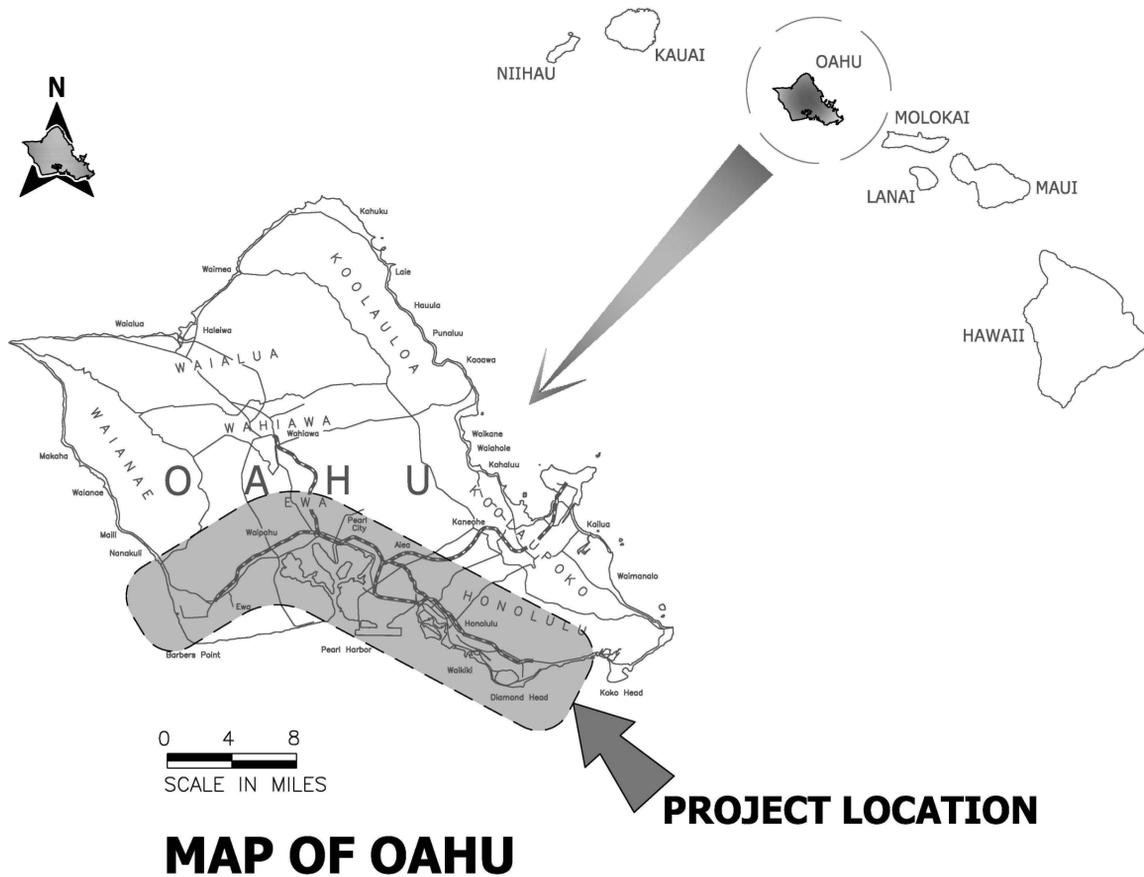
Map Unit Name (Series and Phase): _____	Drainage Class: _____ <i>Circle</i>				
Taxonomy (Subgroup): _____	Field Observations Confirm Mapped Type? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Redoximorphic Feature Colors (Munsell Moist)	Redoximorphic Feature Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
Hydric Soil Indicators: <input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquatic Moisture Regime <input type="checkbox"/> Reducing Conditions <input type="checkbox"/> Gleyed or Low-Chroma Colors <input type="checkbox"/> Concretions <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Other (explain in remarks)					
Remarks: <u>No soil investigated.</u>					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Is this Sampling Point Within a Wetland?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Wetland Hydrology Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Hydric Soils Present?	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Remarks: <u>Form used to document non-wetland waters' characteristics at this location.</u>					

Form Content Approved by HQUSACE 3/92

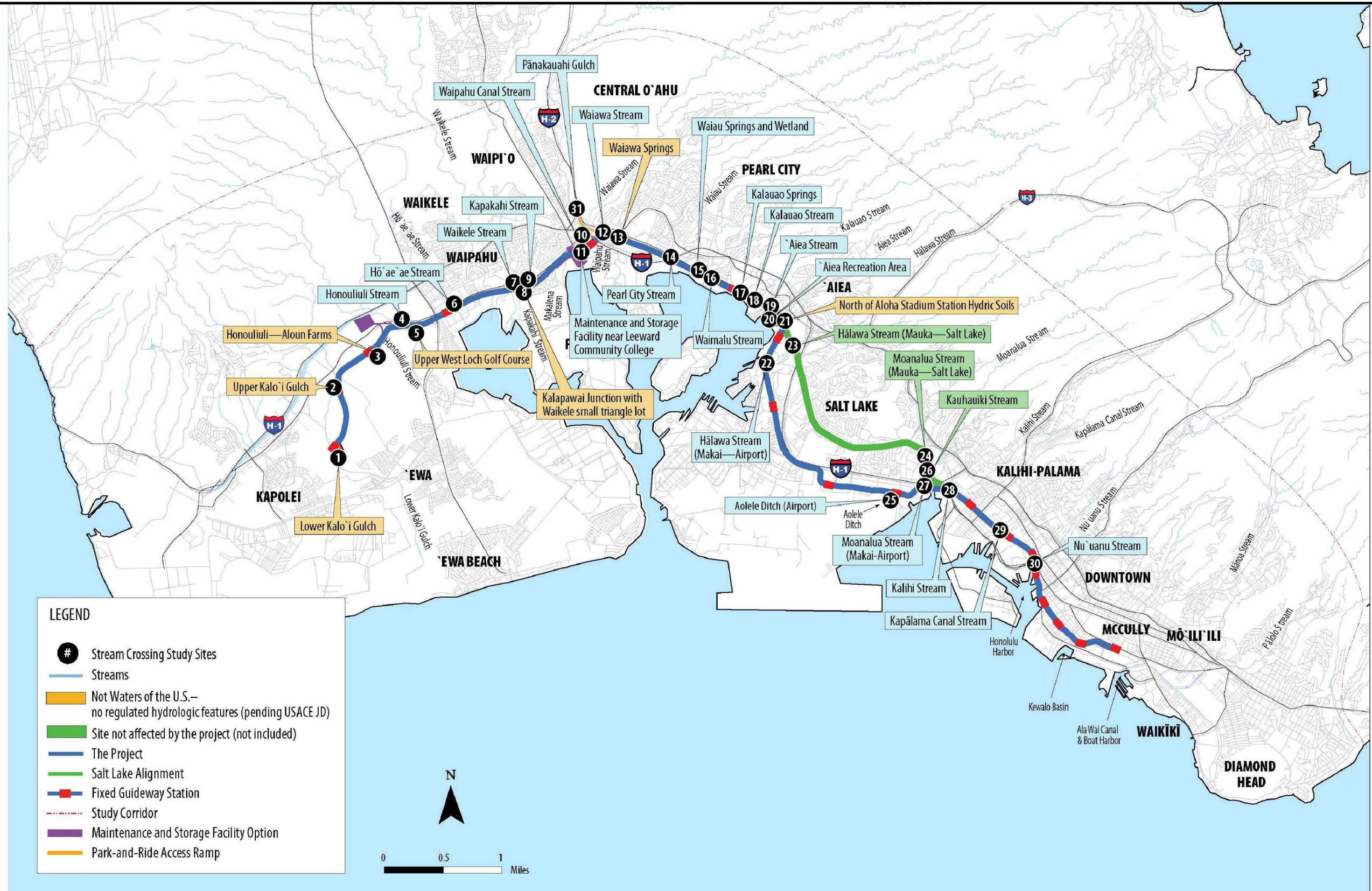
HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS

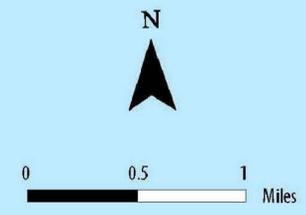
CITY AND COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

MAY 2009



LEGEND

- # Stream Crossing Study Sites
- Streams
- Not Waters of the U.S.—no regulated hydrologic features (pending USACE JD)
- Site not affected by the project (not included)
- The Project
- Salt Lake Alignment
- Fixed Guideway Station
- Study Corridor
- Maintenance and Storage Facility Option
- Park-and-Ride Access Ramp



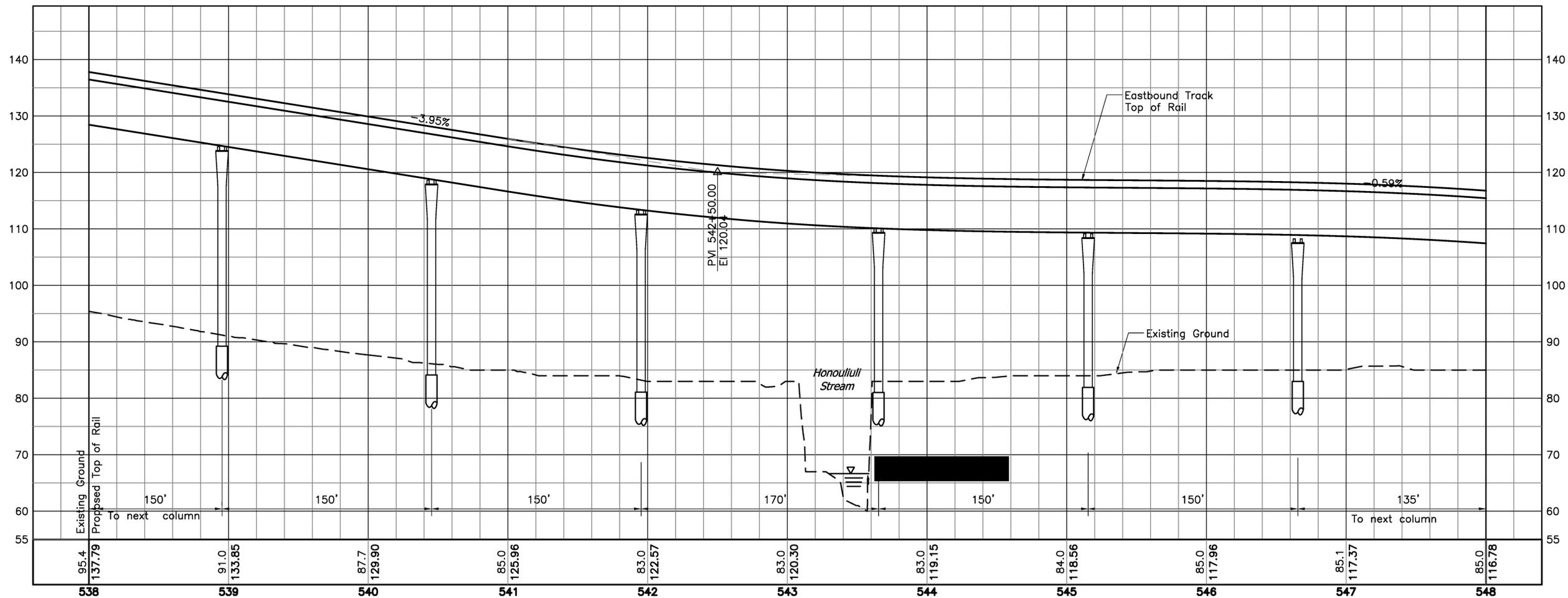
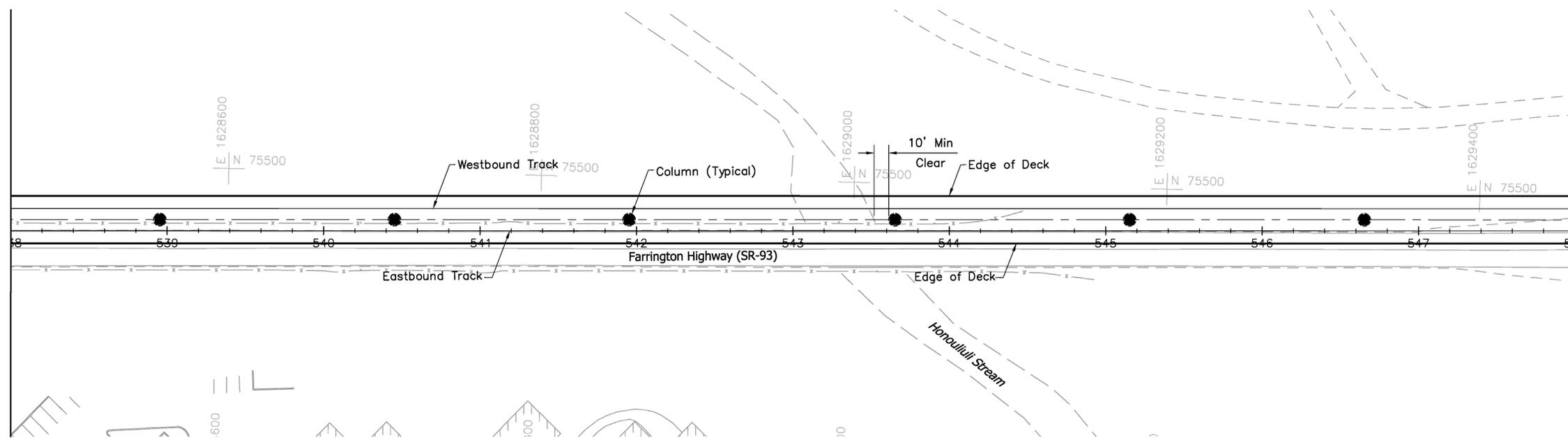
CITY & COUNTY OF HONOLULU
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RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:

**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
KEY MAP**

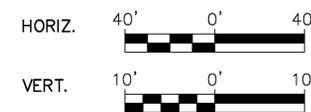
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KEY MAP
Date: 05-22-09



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DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

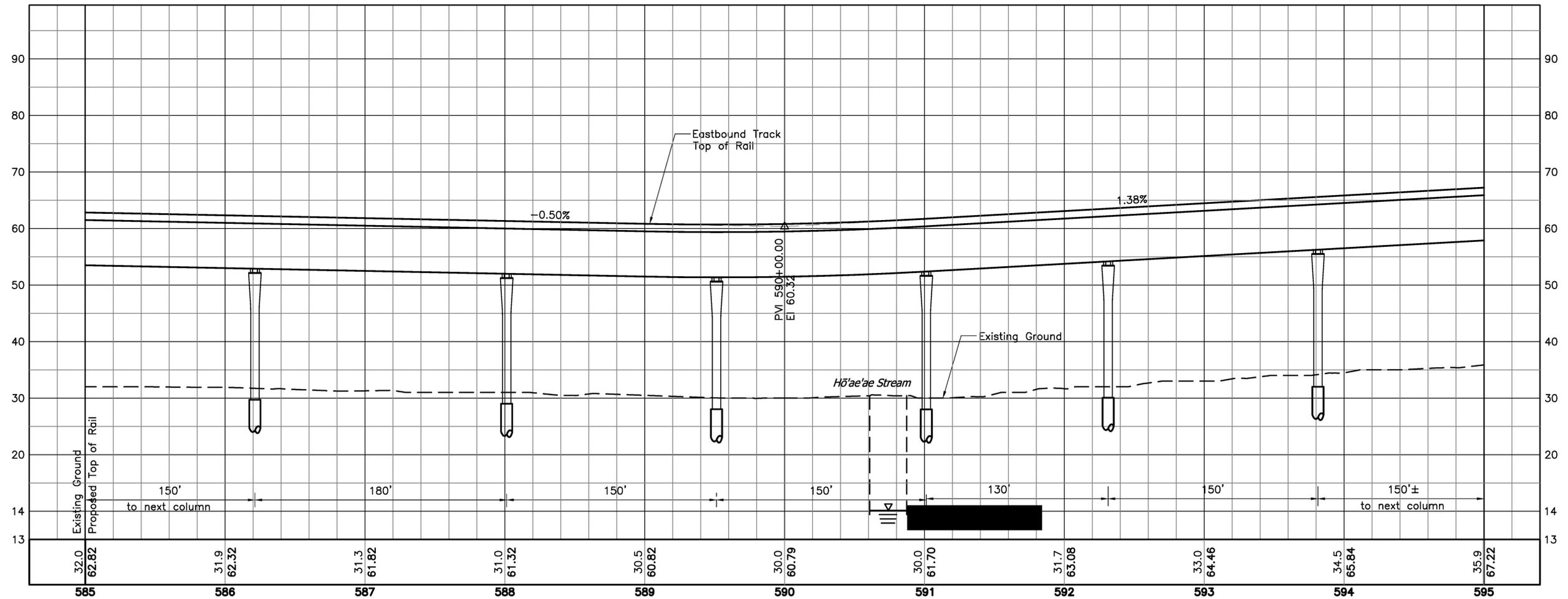
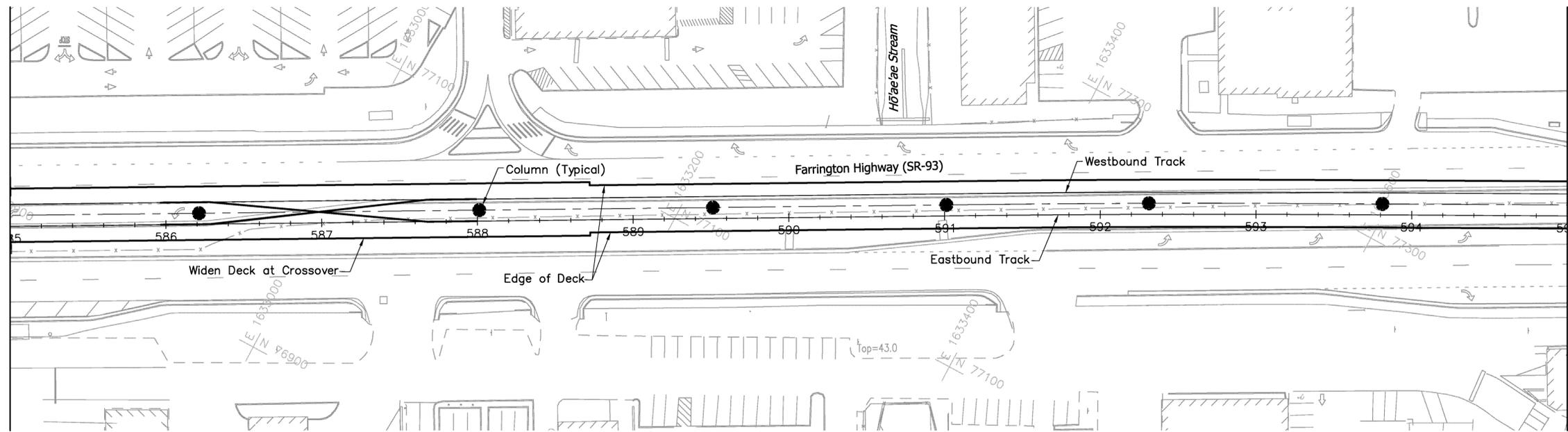
HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
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PLAN AND PROFILE
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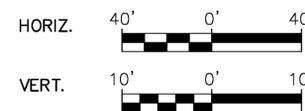
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Date: 05-22-09



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RAPID TRANSIT DIVISION

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Scale:



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
HŌ'AE'AE STREAM
PLAN AND PROFILE**

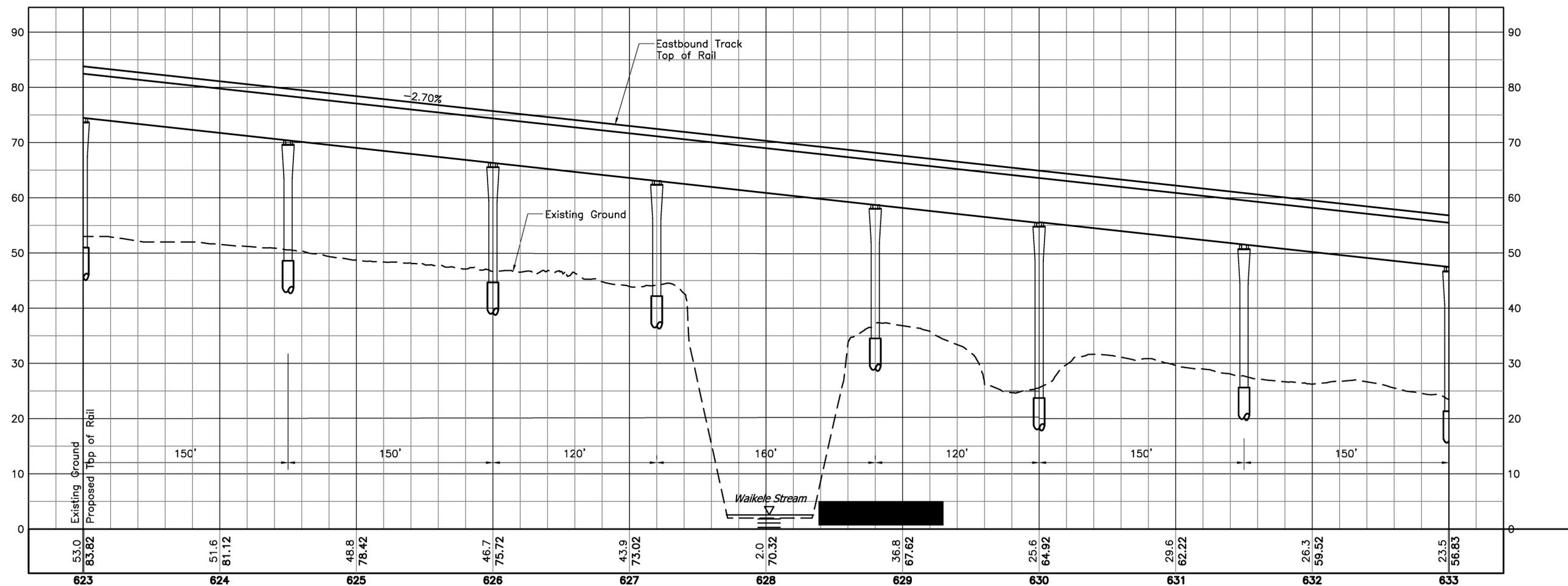
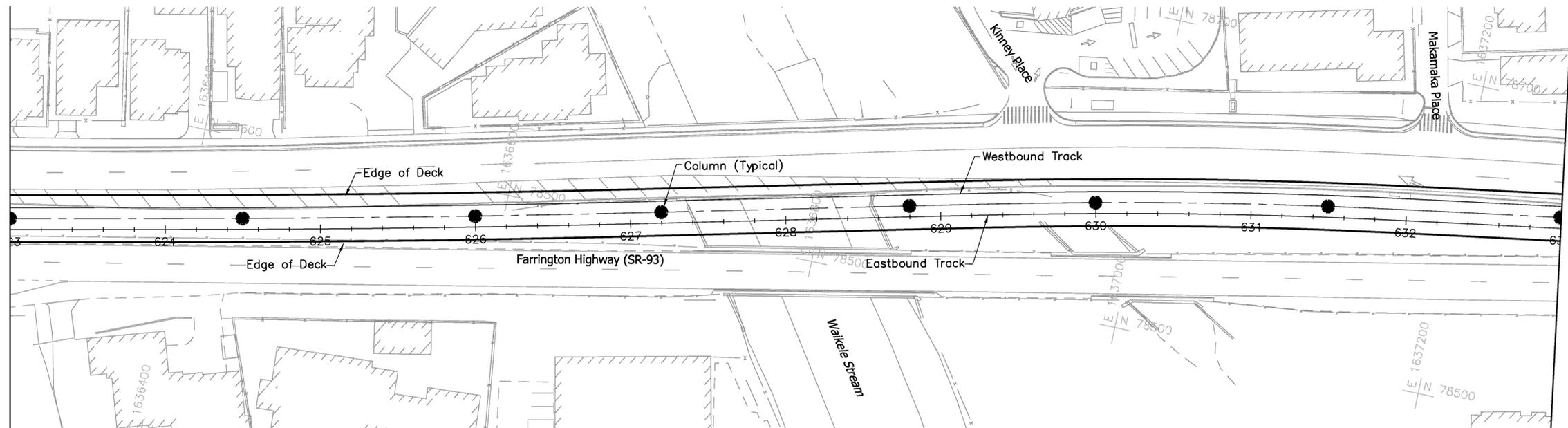
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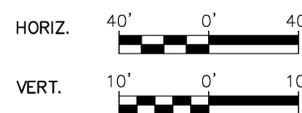
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RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**WAIKELE STREAM
PLAN AND PROFILE**

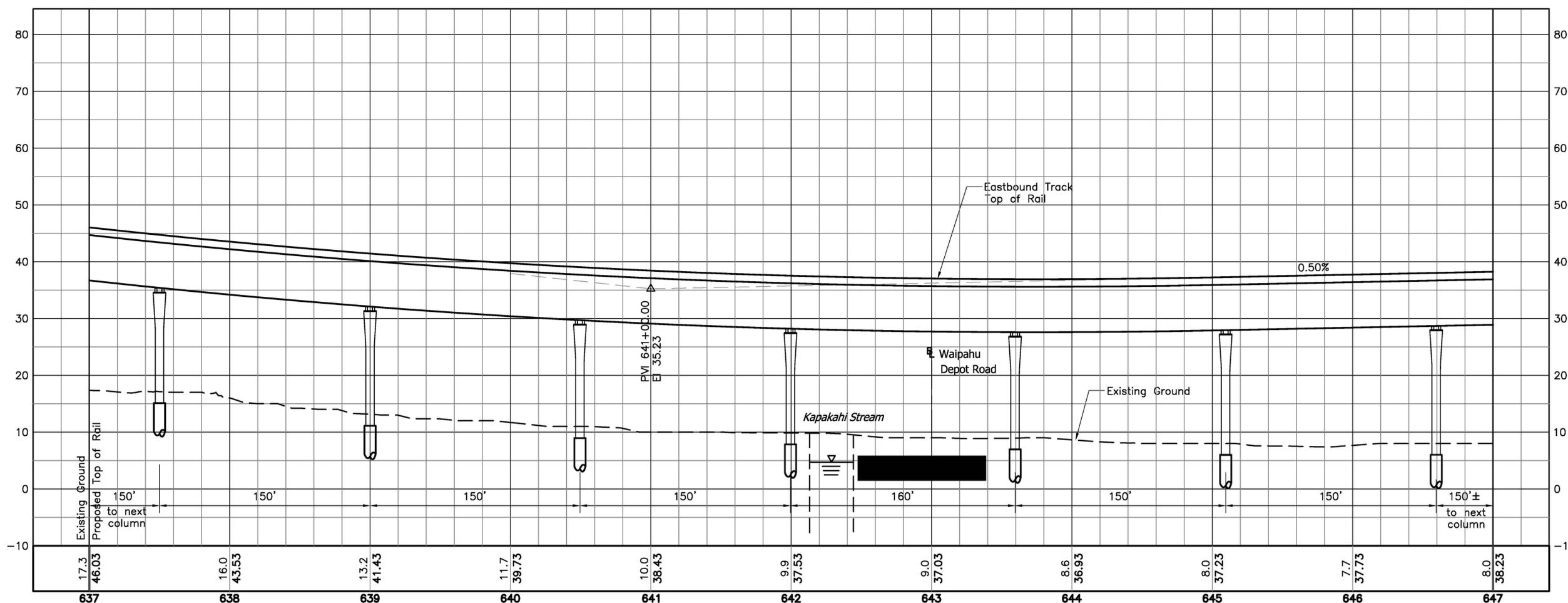
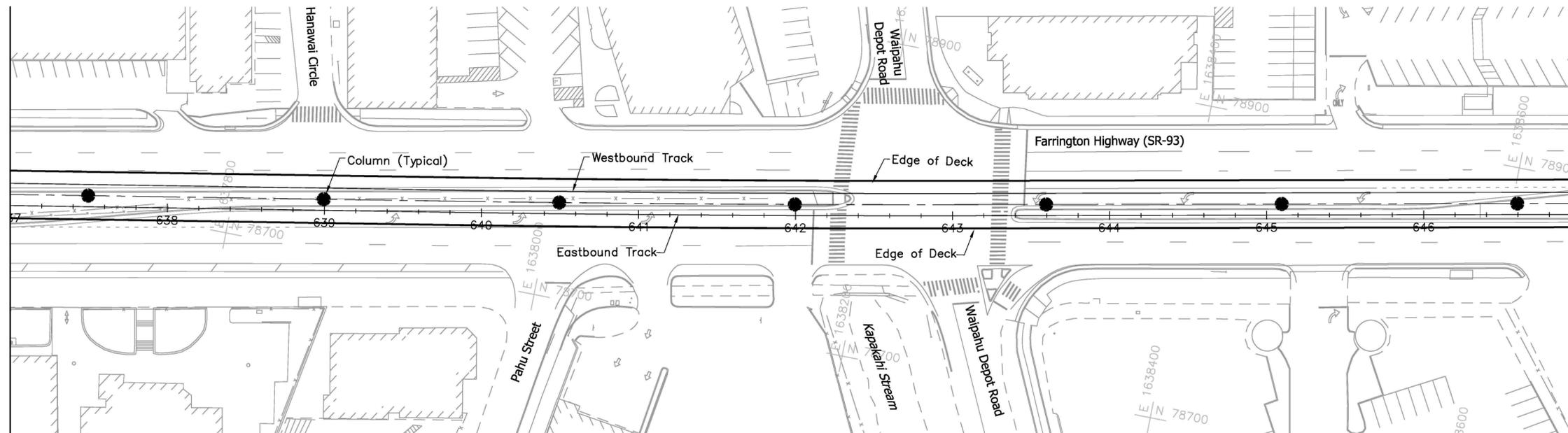
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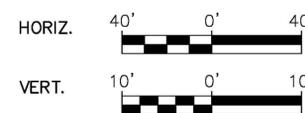
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HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
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KAPAKAHI STREAM
PLAN AND PROFILE**

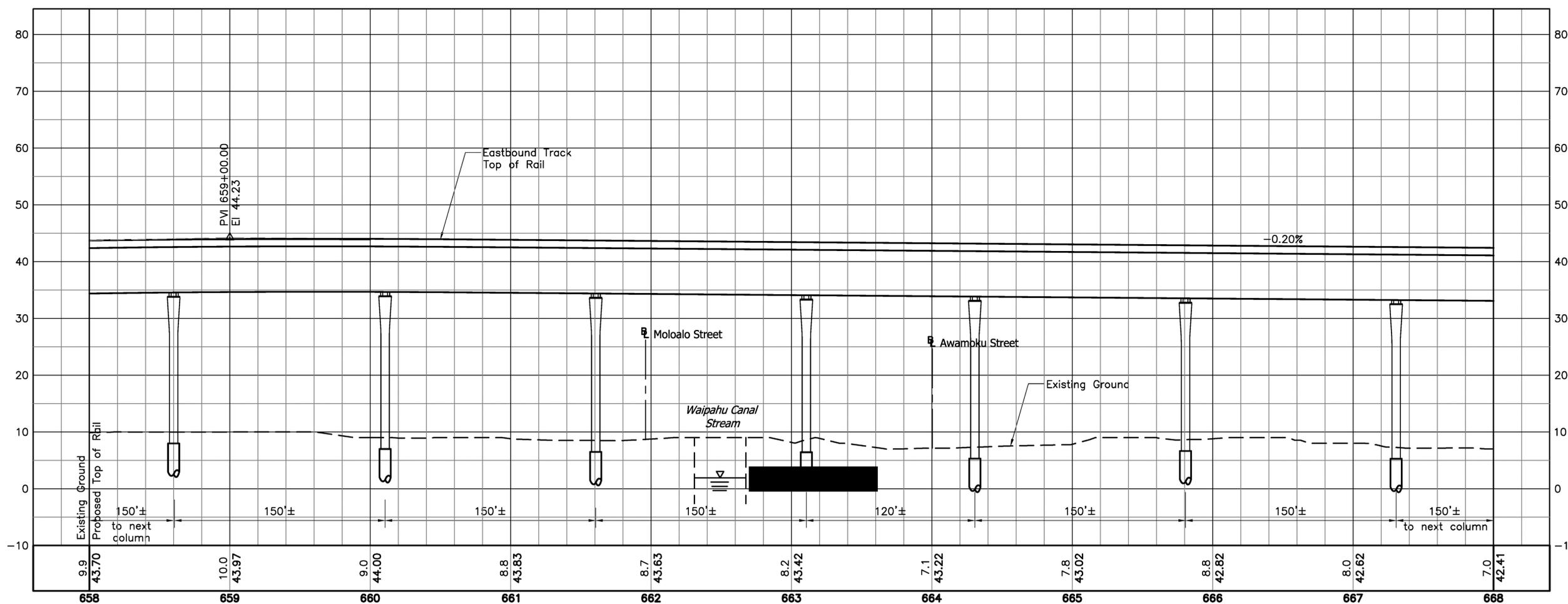
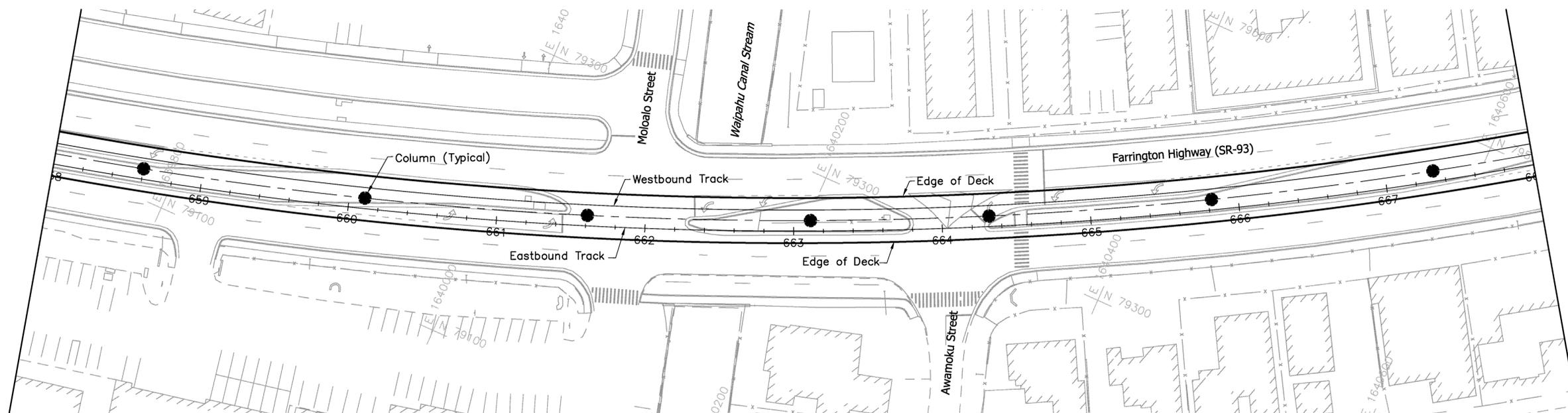
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Page No. 5 of 25

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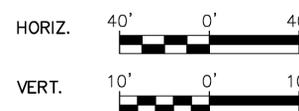
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HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
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WAIPAHU CANAL STREAM
PLAN AND PROFILE**

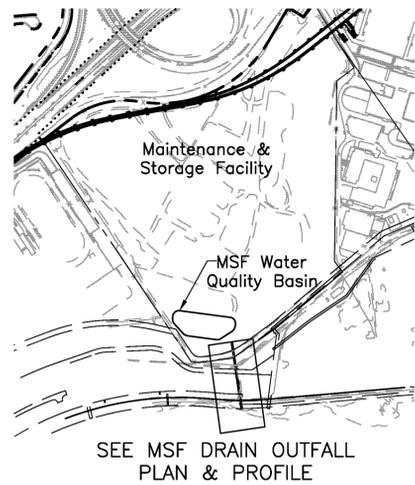
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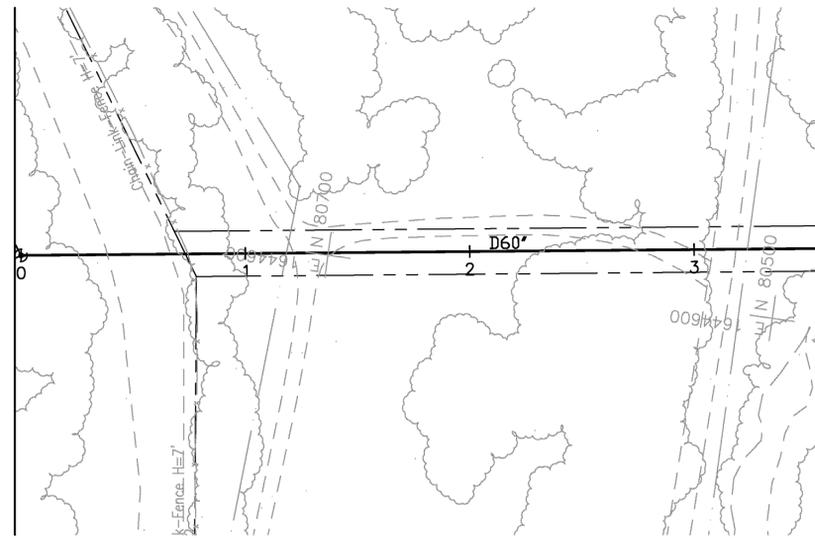
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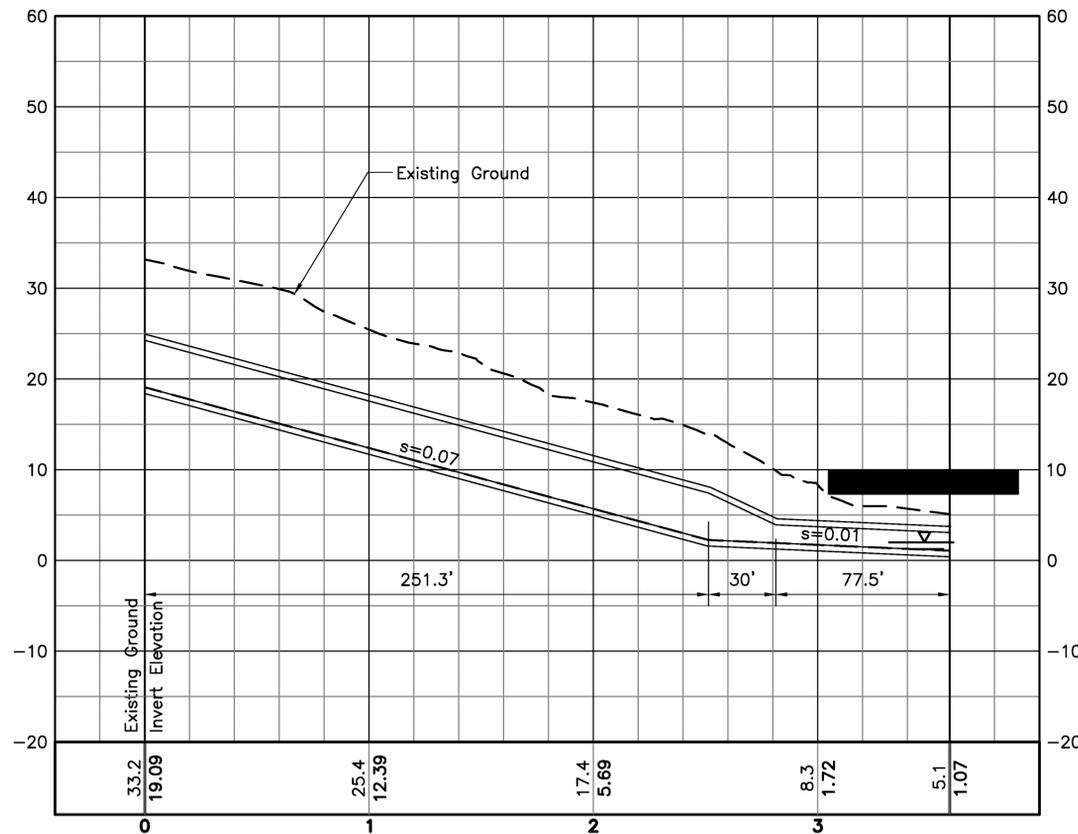
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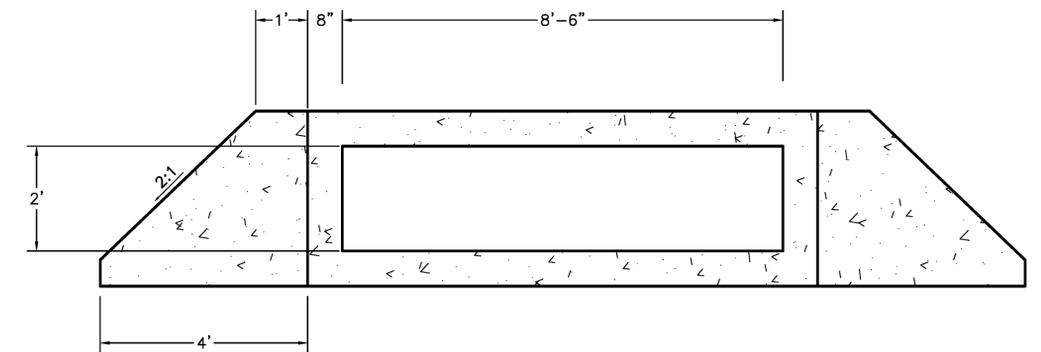
MAINTENANCE & STORAGE FACILITY (MSF) KEY PLAN



MSF DRAIN OUTFALL PLAN



MSF DRAIN OUTFALL PROFILE



OUTLET DETAIL



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HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
MAINTENANCE & STORAGE FACILITY
DRAIN OUTFALL**

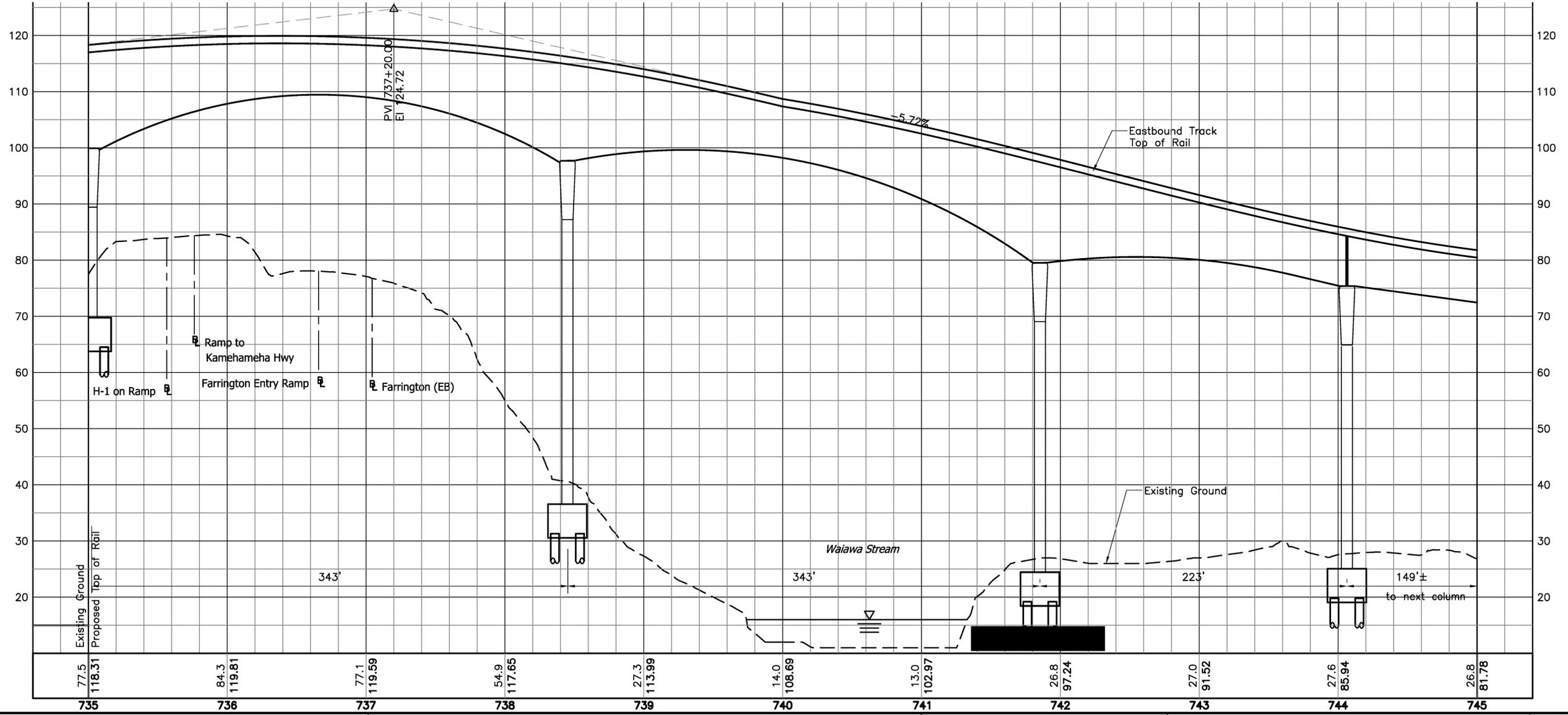
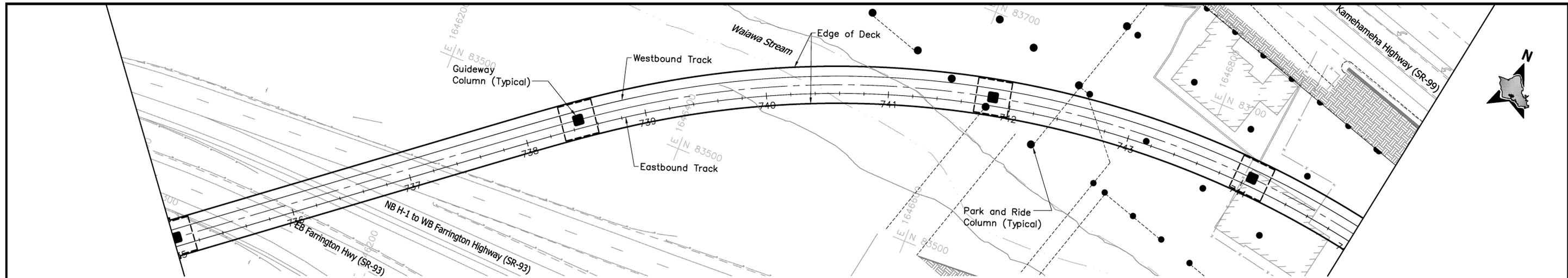
PLAN AND PROFILE

Page No. 7 of 25

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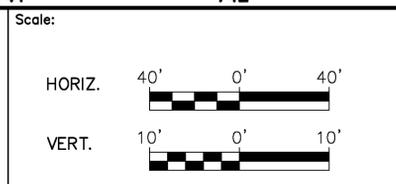
SITE 11

Date: 05-22-09



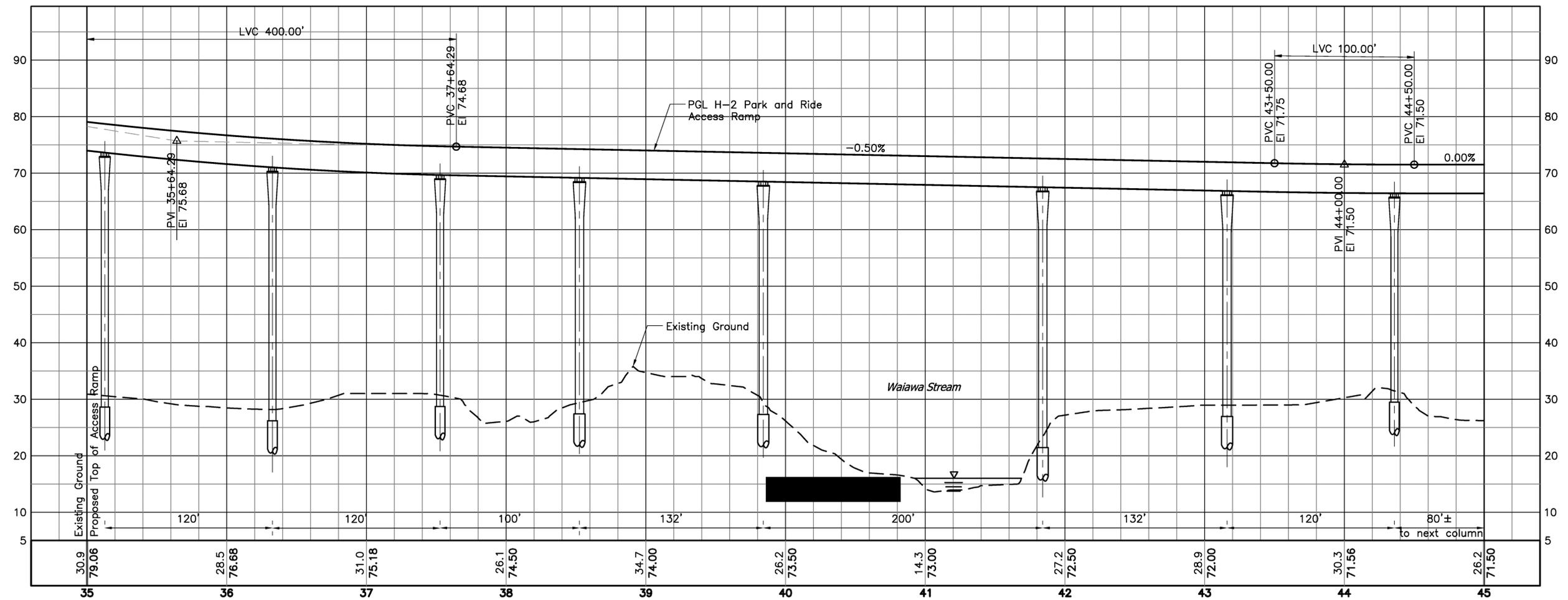
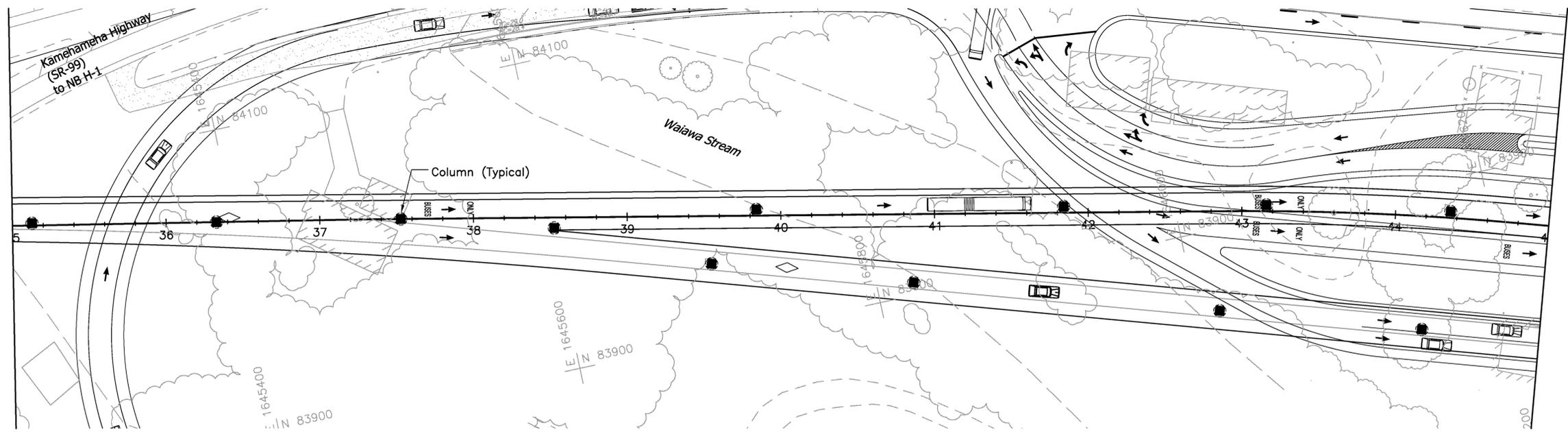
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HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
WAIAWA STREAM
PLAN AND PROFILE
SHEET 1 OF 2
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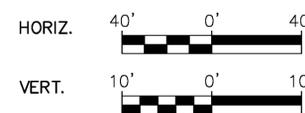
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Date: 05-22-09



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RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



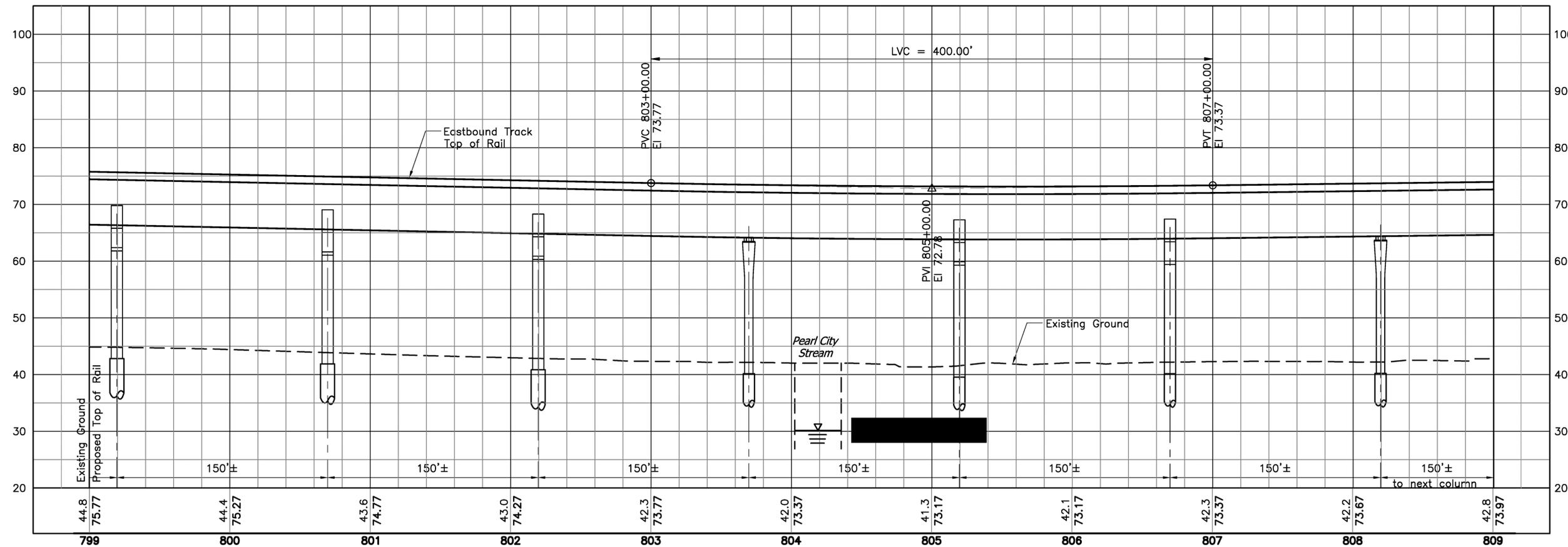
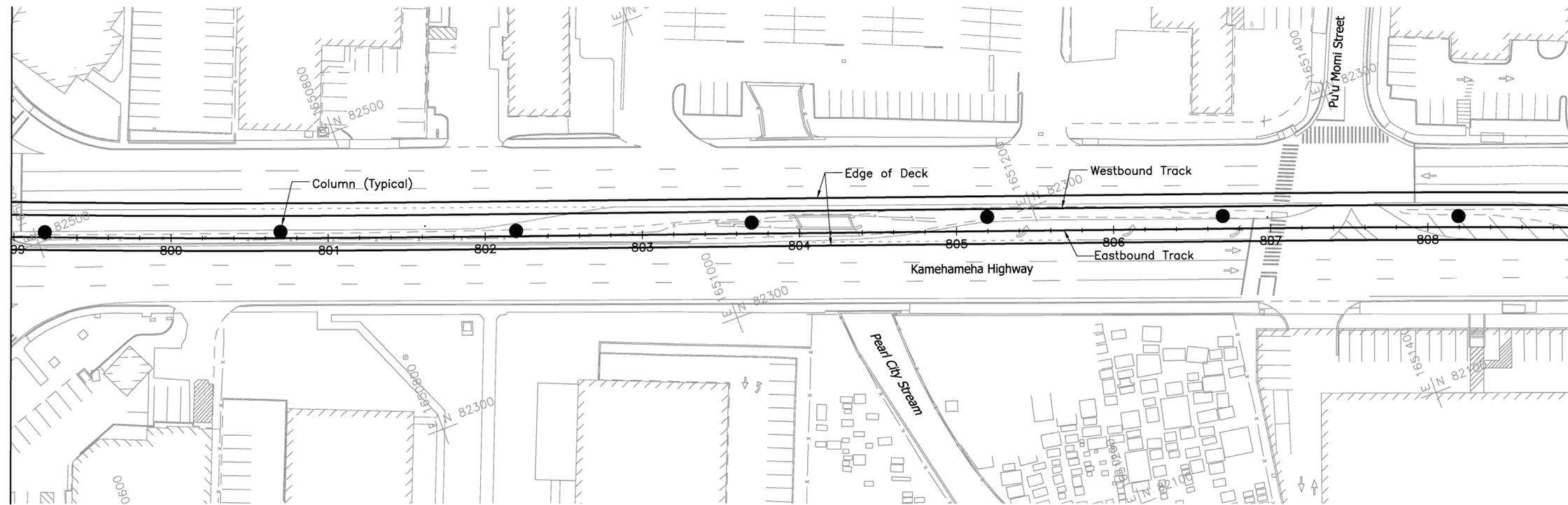
STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
WAIAWA STREAM
PLAN AND PROFILE
SHEET 2 OF 2
STA 35+00 TO STA 45+00

Page No. 9 of 25

Drawing No:

SITE 12

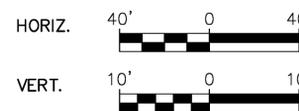
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HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**PEARL CITY STREAM
PLAN AND PROFILE**

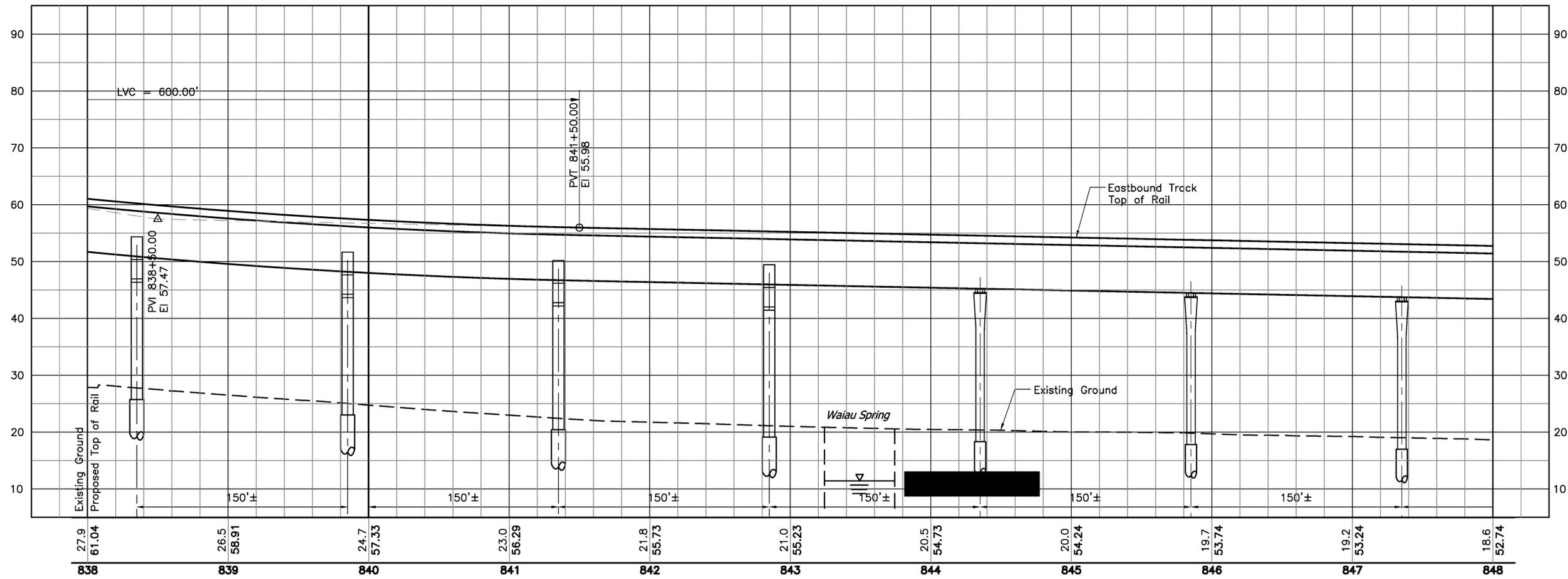
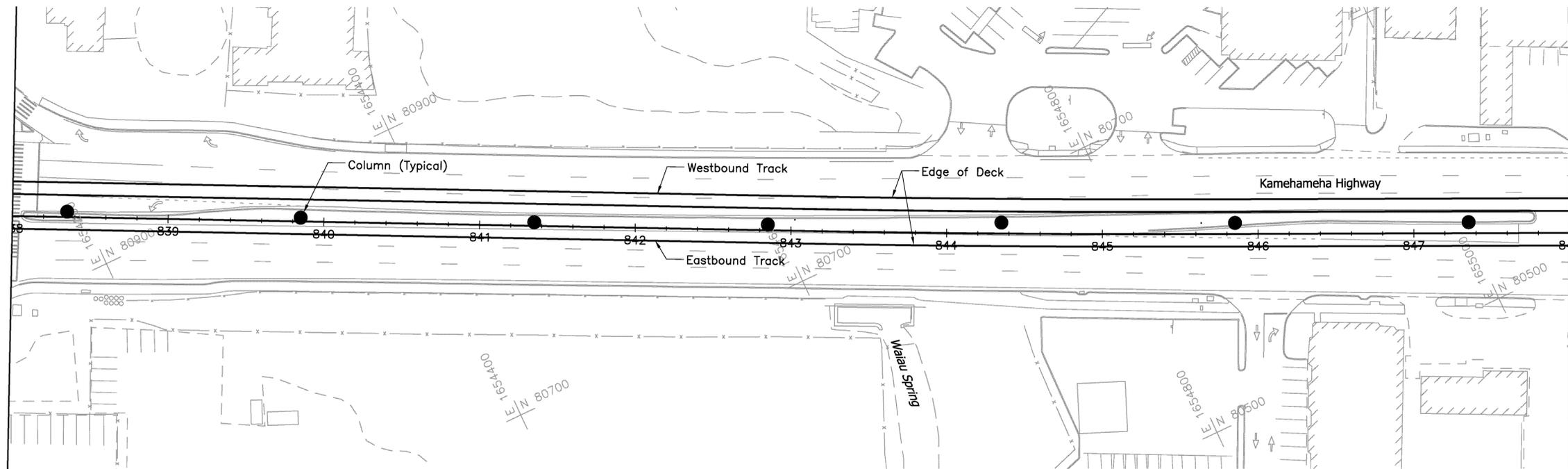
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Page No. 10 of 25

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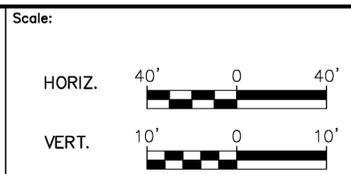
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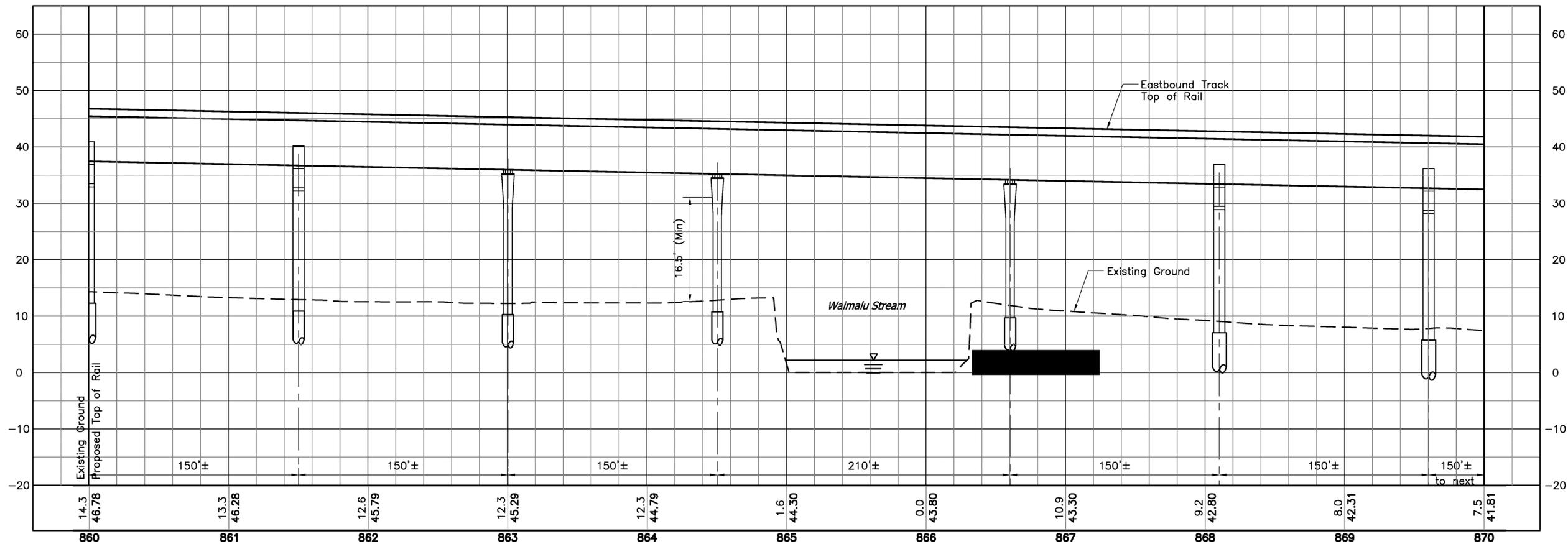
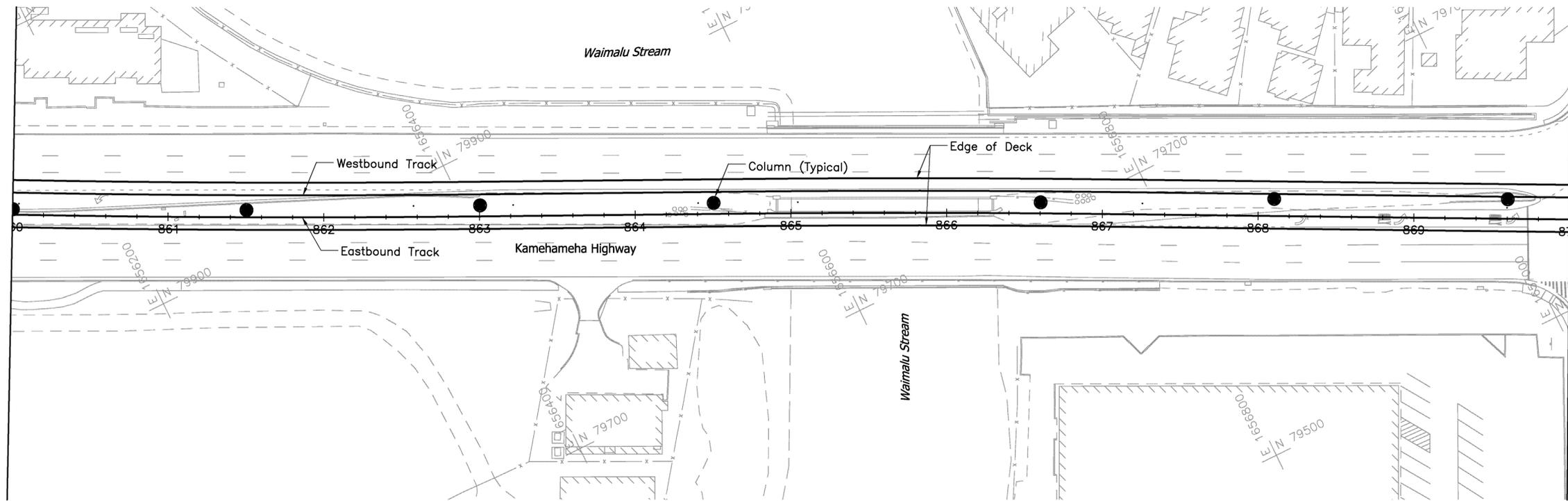
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DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**WAIU SPRING
PLAN AND PROFILE**
STA 838+00 TO STA 848+00

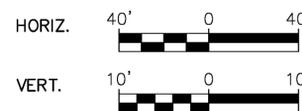
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Drawing No:
SITE 15
Date: 05-22-09



CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
WAIMALU STREAM
PLAN AND PROFILE**

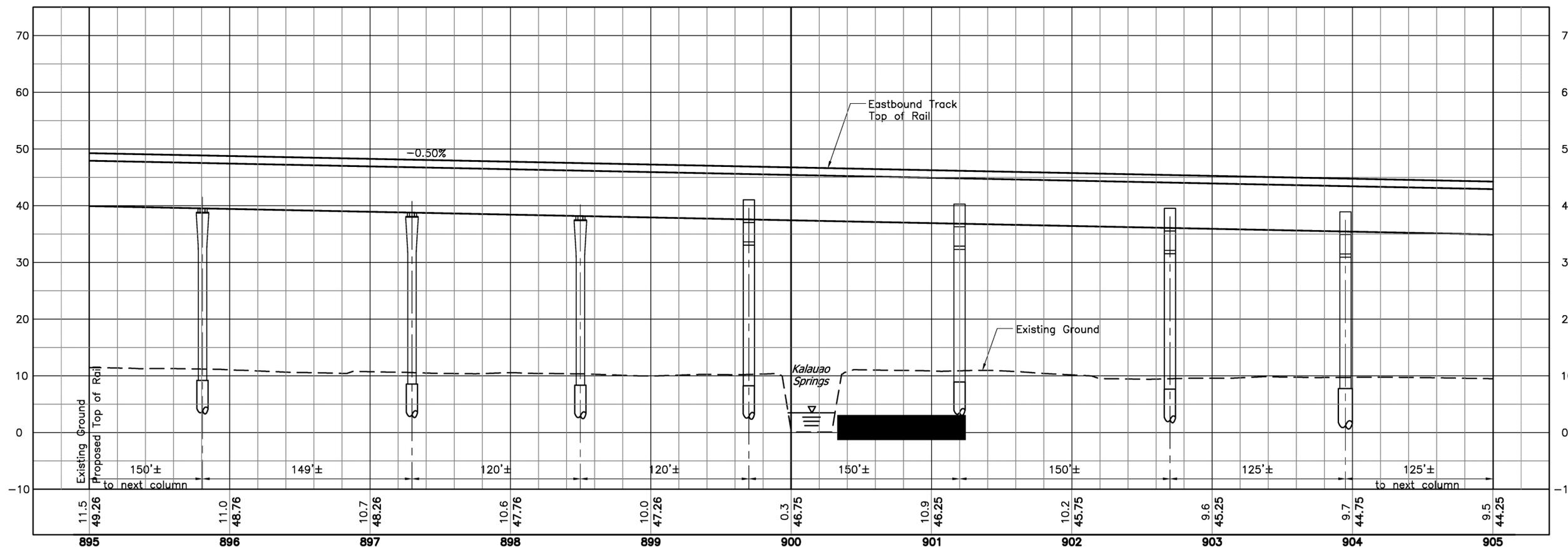
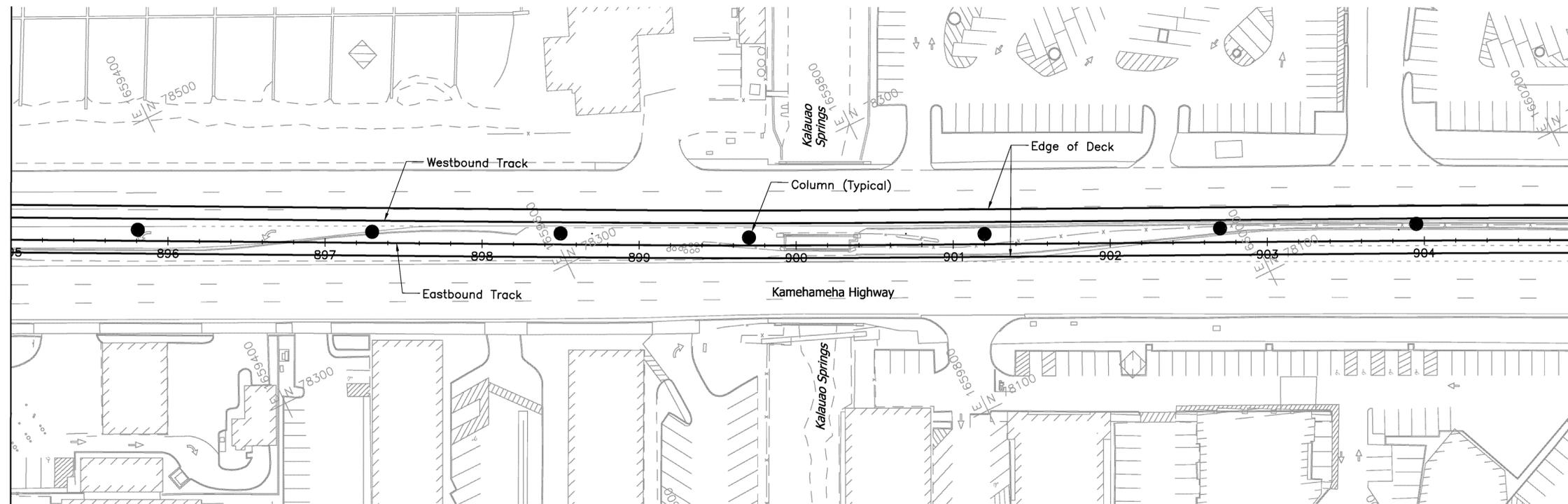
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Drawing No:

SITE 16

Date: 05-22-09



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DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**KALUAOO SPRINGS
PLAN AND PROFILE**

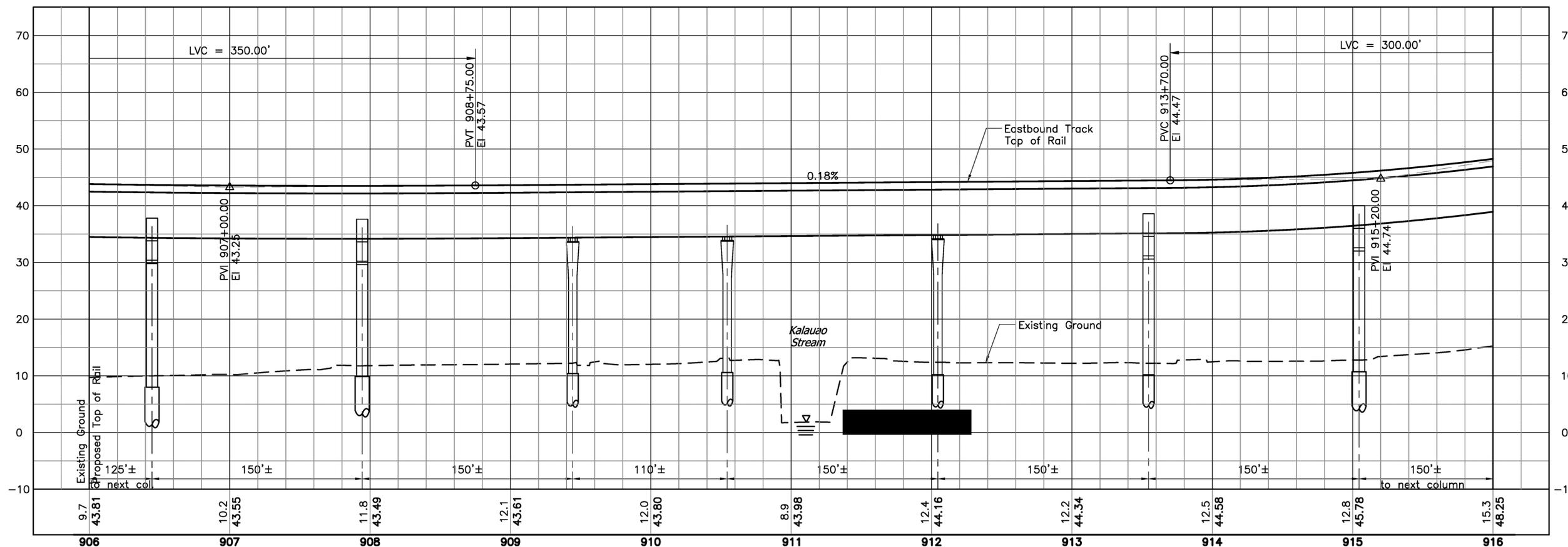
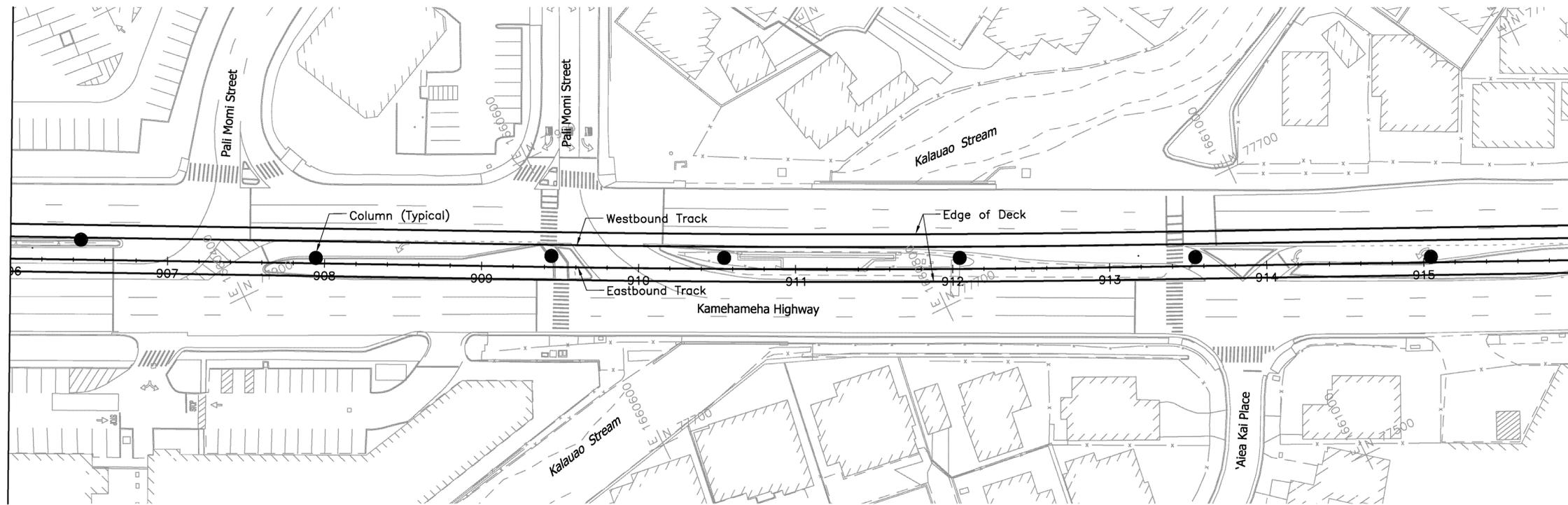
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Drawing No:

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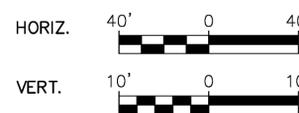
Date: 05-22-09



CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
KALUAUA STREAM
PLAN AND PROFILE**

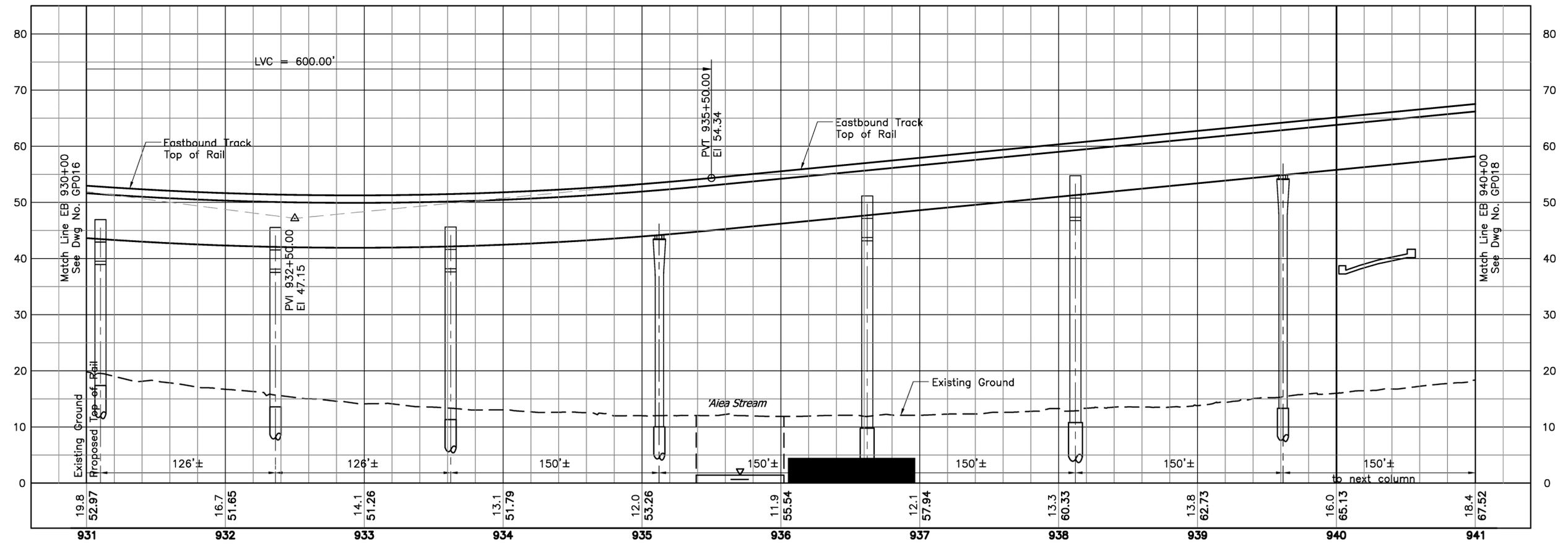
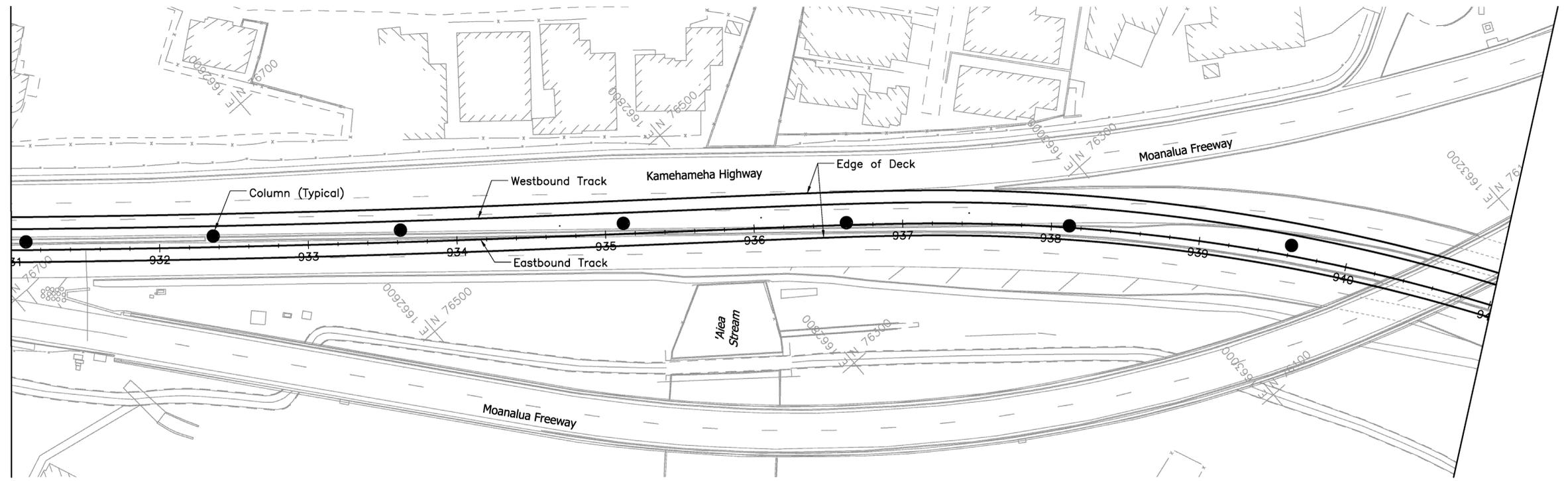
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Drawing No:

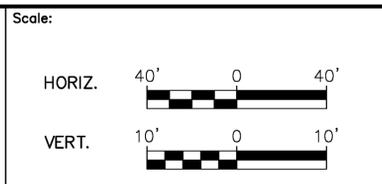
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Date: 05-22-09



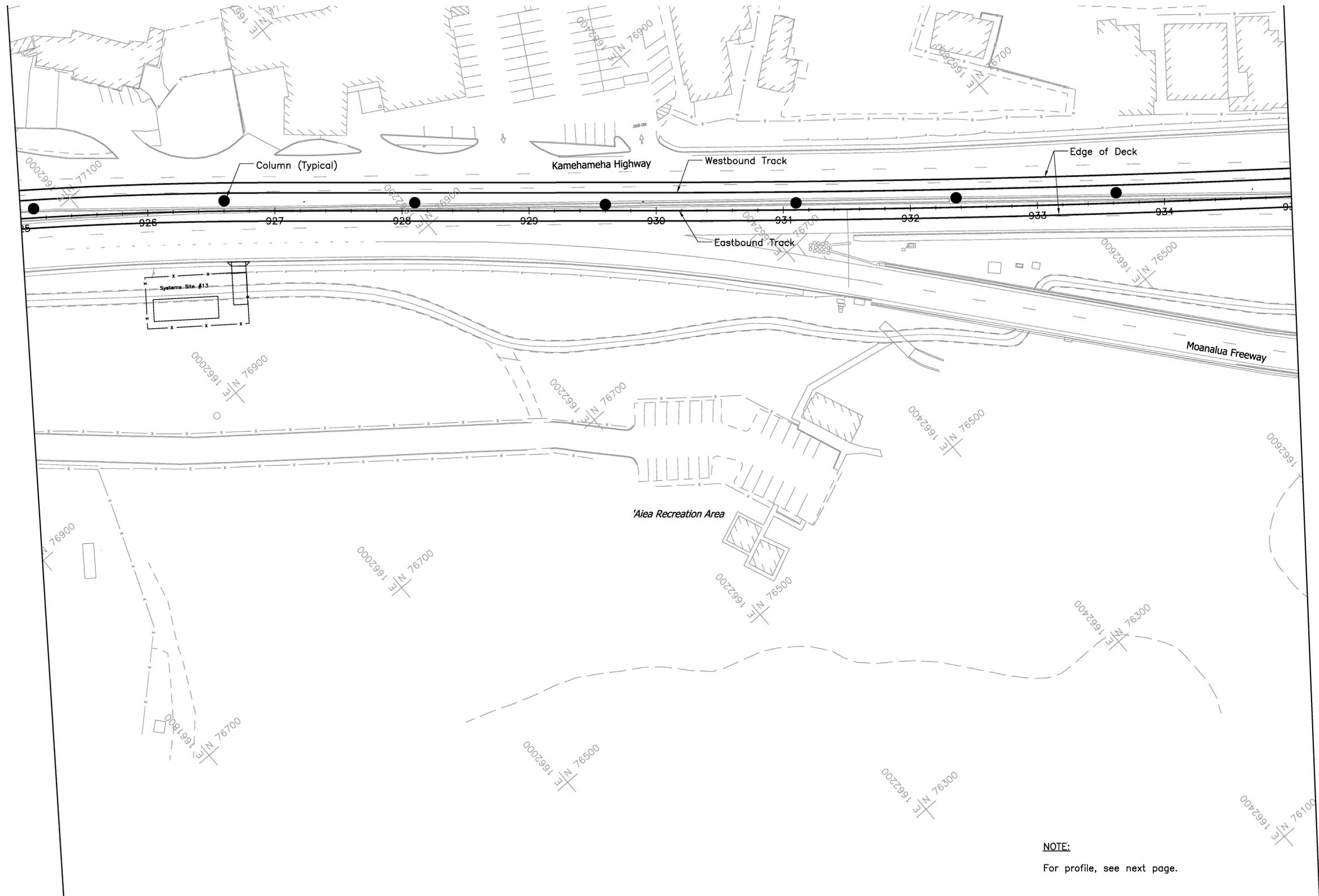
CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**'AIEA STREAM
PLAN AND PROFILE**
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Page No. 15 of 25
Drawing No:
SITE 19
Date: 05-22-09



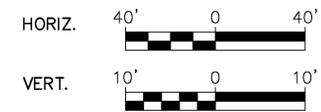
NOTE:
For profile, see next page.



CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
'AIEA RECREATION AREA
PLAN**

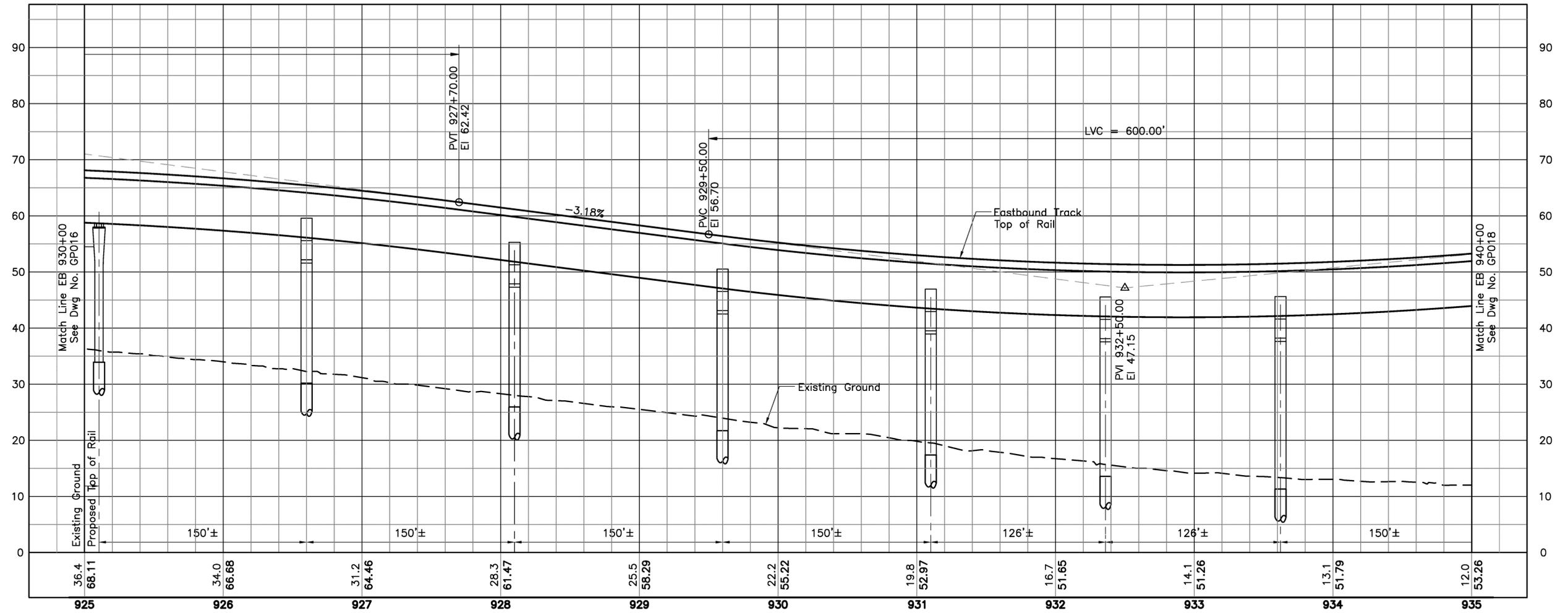
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SITE 20

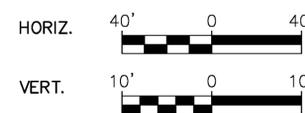
Date: 05-22-09



CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
'AIEA RECREATION AREA
PROFILE

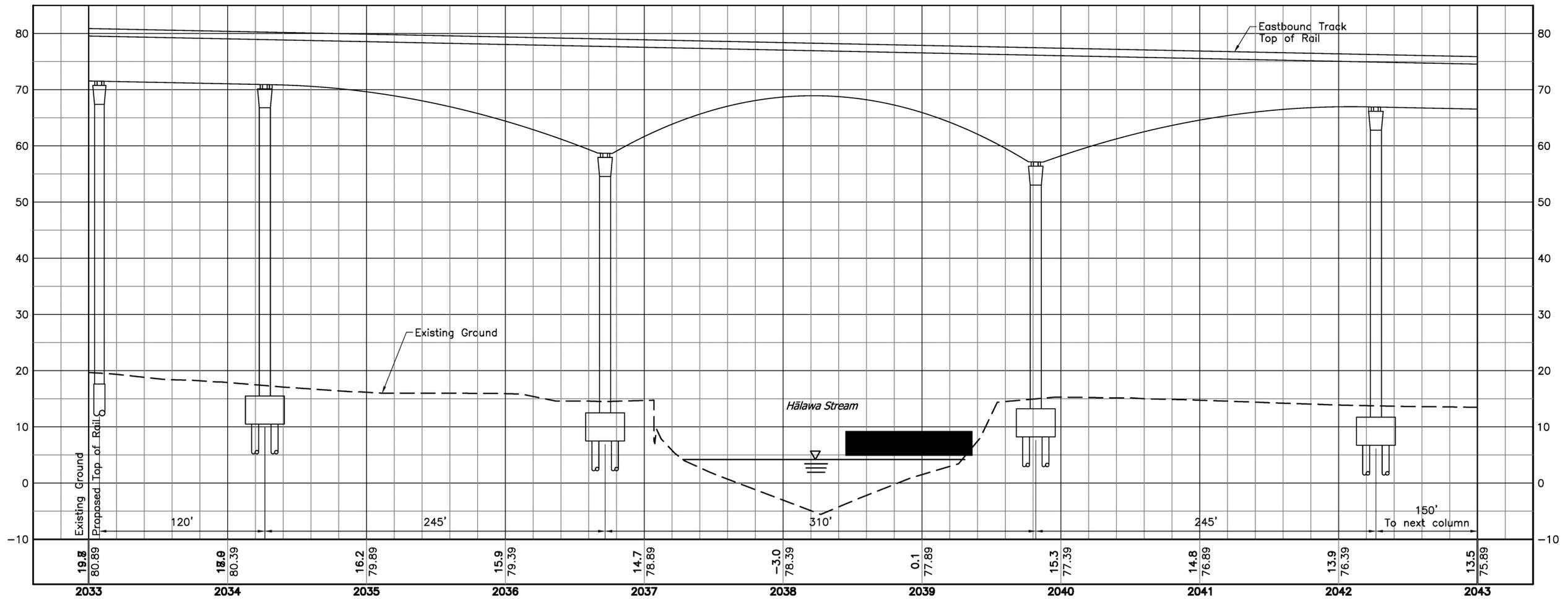
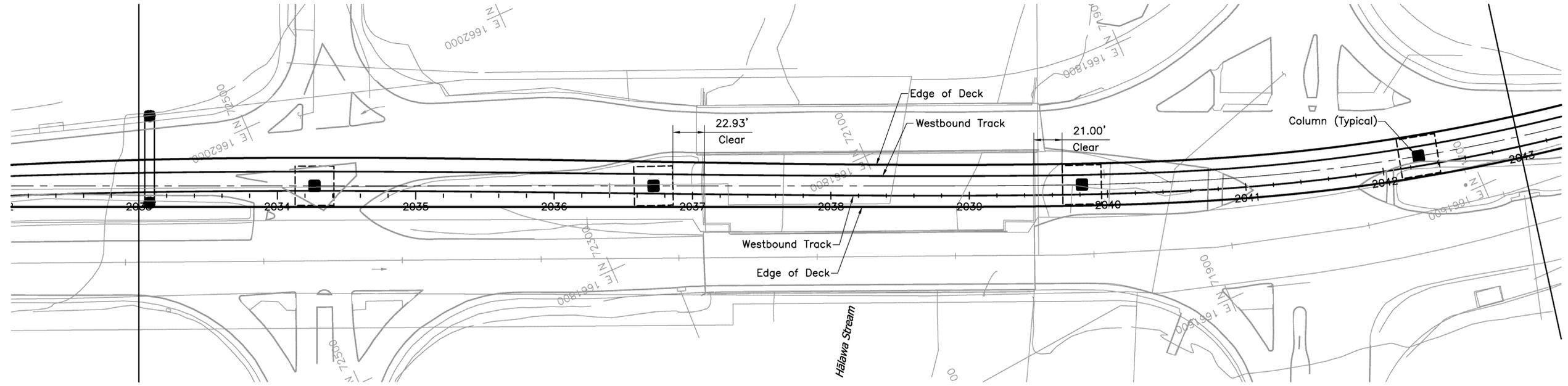
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SITE 20

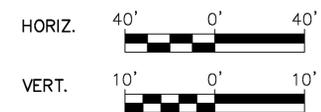
Date: 05-22-09



CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
HĀLAWĀ STREAM
PLAN AND PROFILE

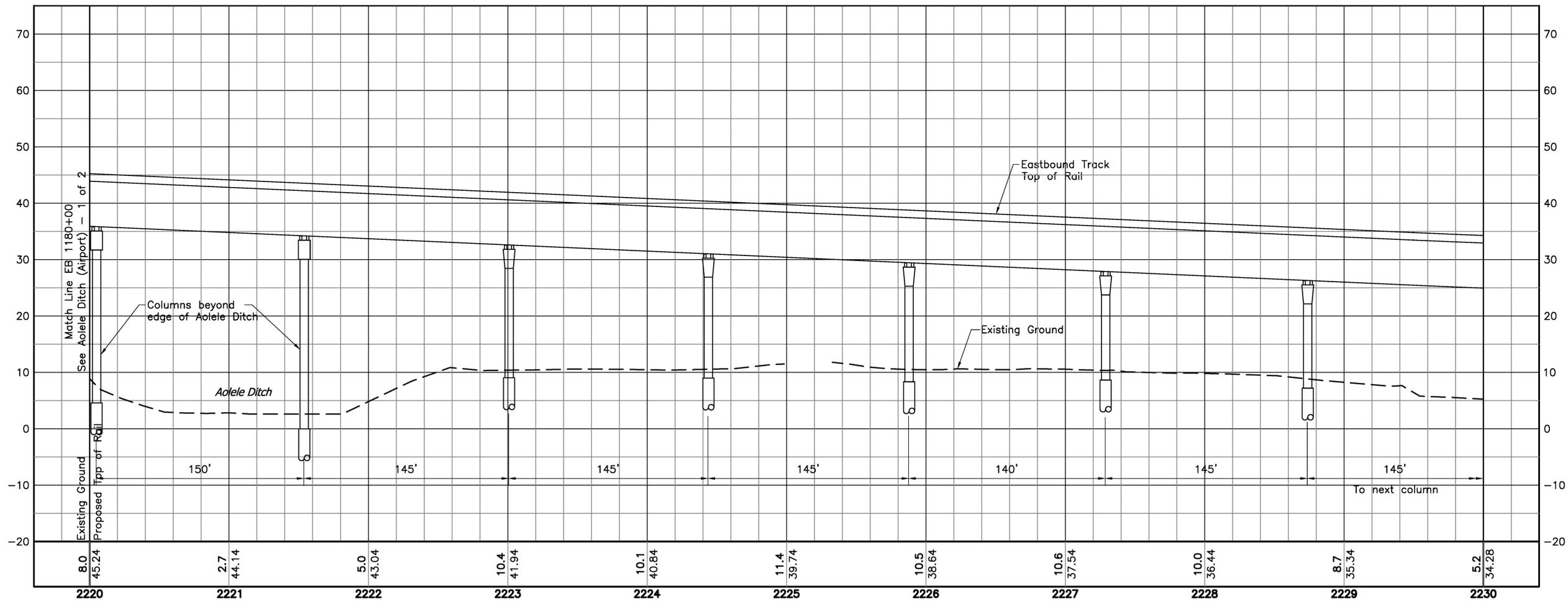
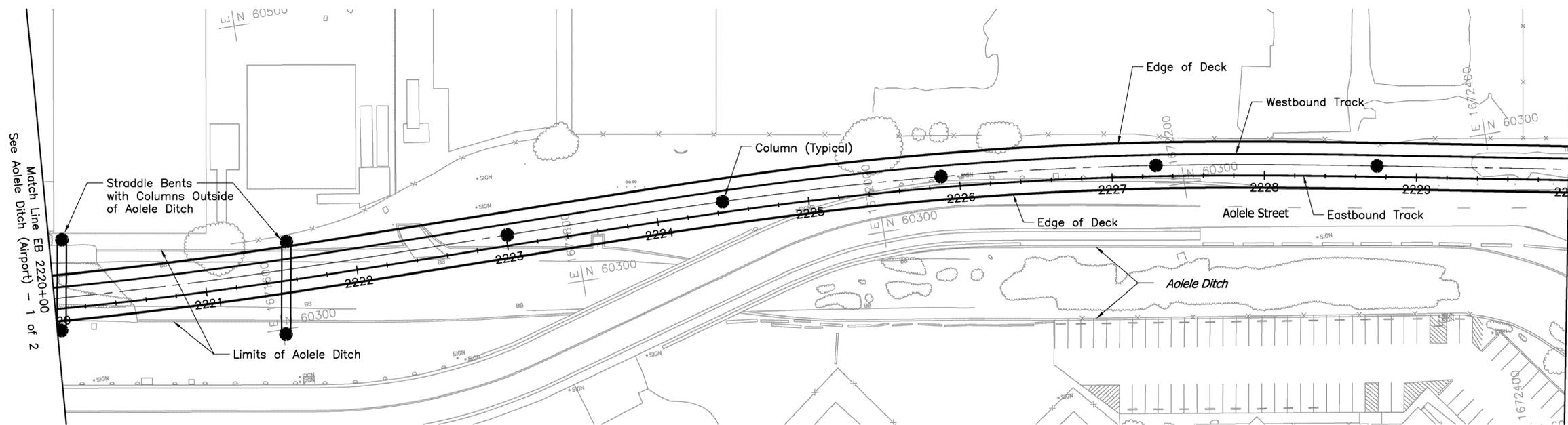
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Drawing No:

SITE 22

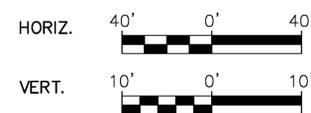
Date: 05-22-09



CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
AOOLE DITCH (AIRPORT) - 2 OF 2
PLAN AND PROFILE**

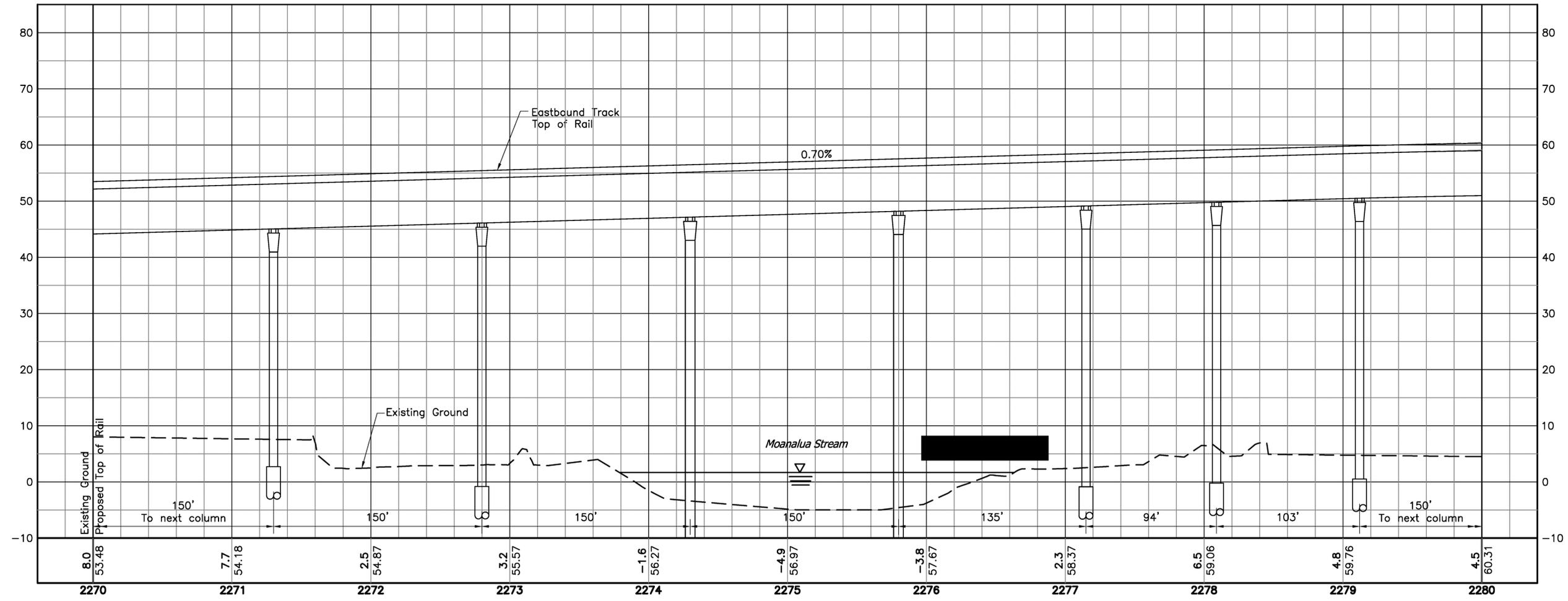
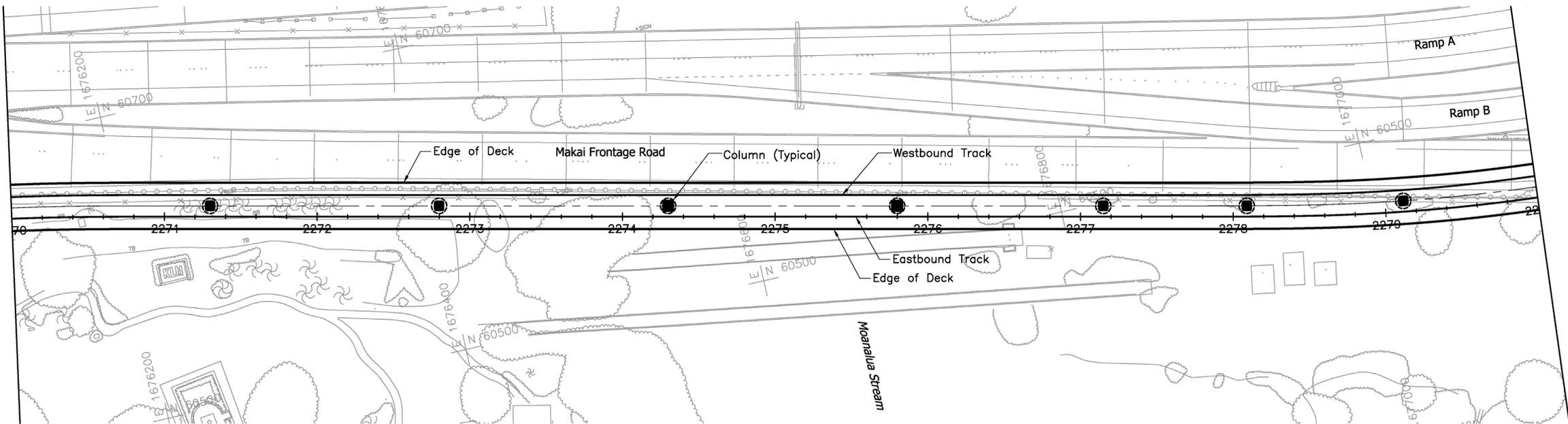
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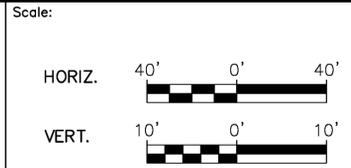
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Date: 05-27-09



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RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
MOANALUA STREAM (MAKAI-AIRPORT)
PLAN AND PROFILE

STA 2270+00 TO STA 2280+00

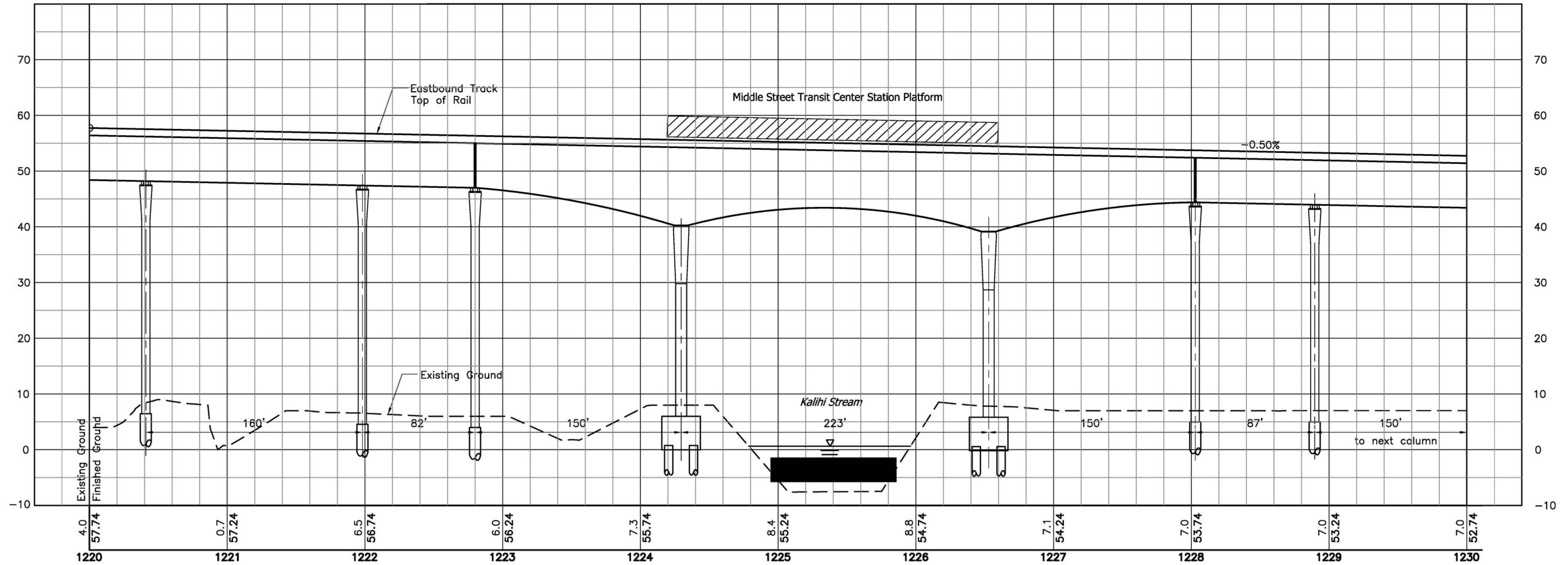
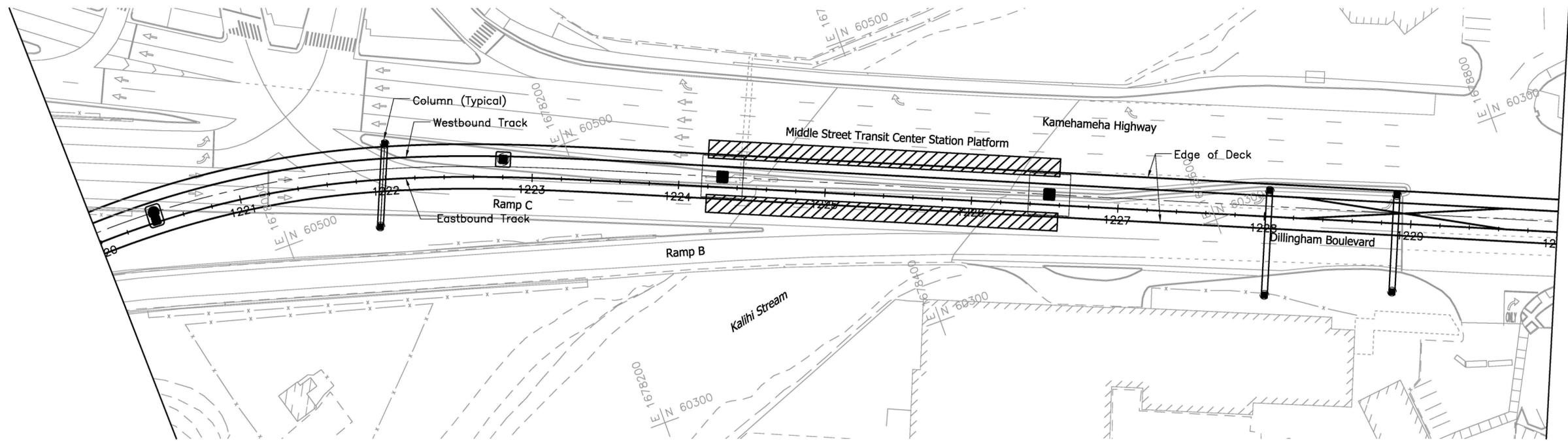
Page No. 21 of 25

Drawing No:

SITE 27

Date: 05-22-09

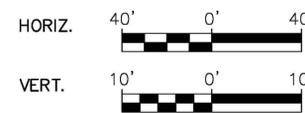
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DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT

Scale:



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**KALIHI STREAM
PLAN AND PROFILE**

STA 1220+00 TO STA 1230+00

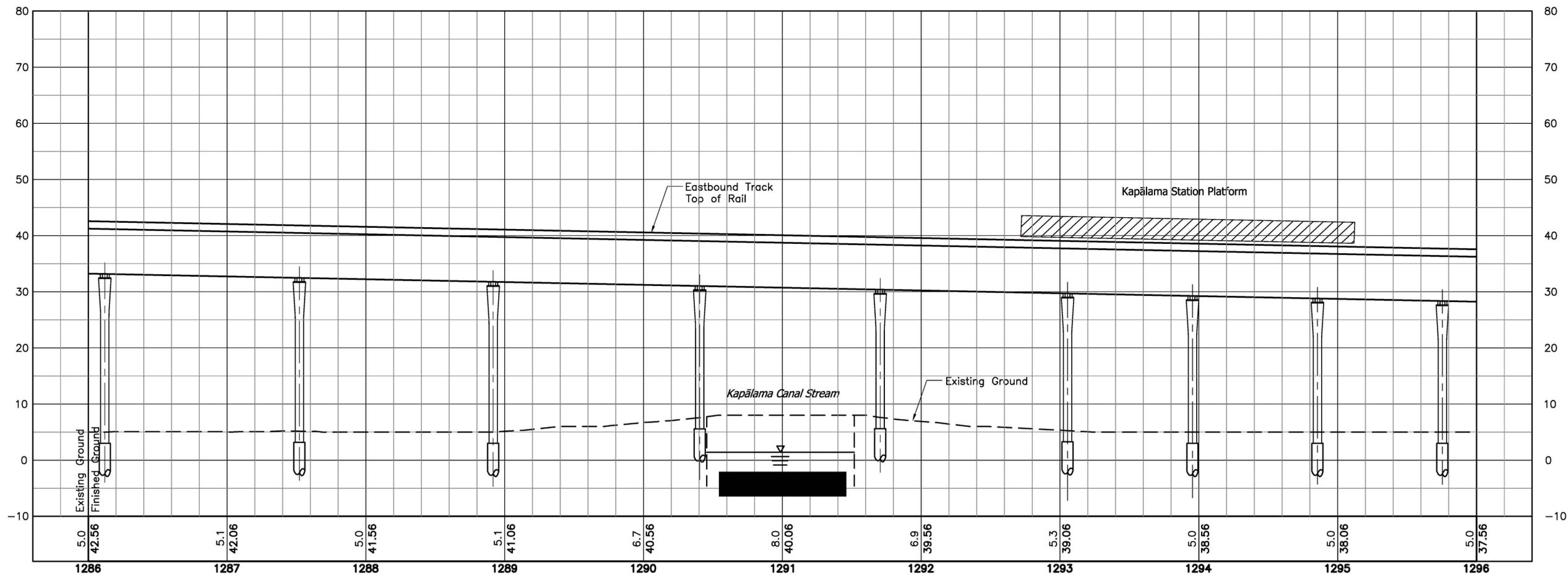
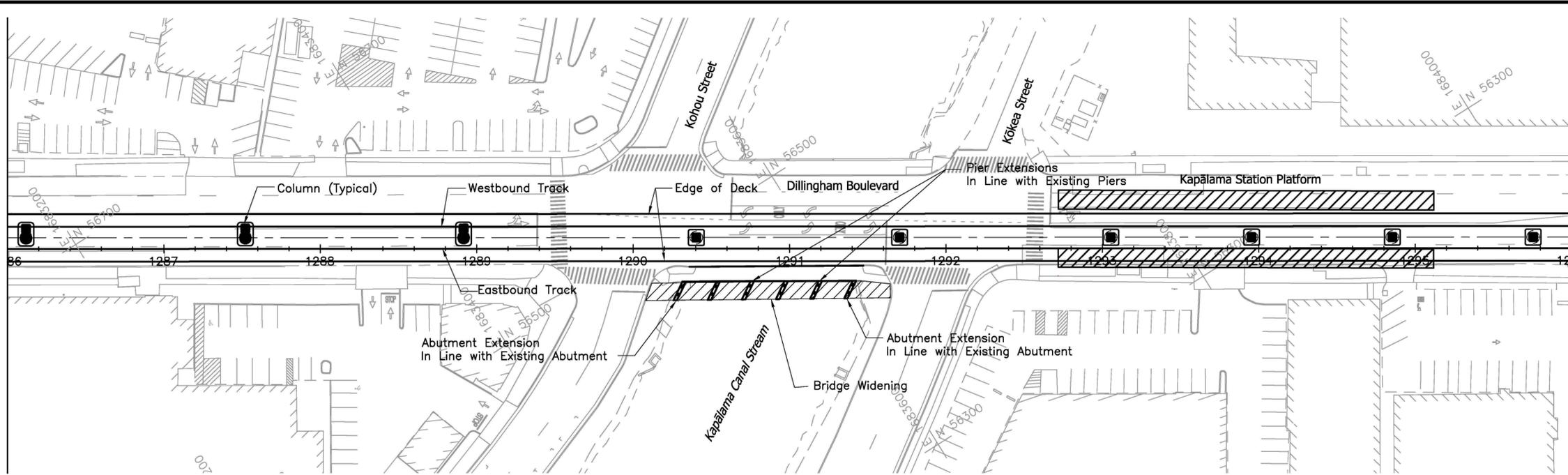
Page No. 22 of 25

Drawing No:

SITE 28

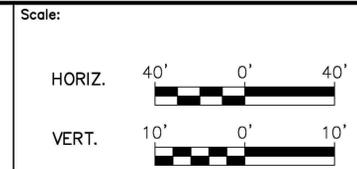
Date: 05-22-09

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CITY & COUNTY OF HONOLULU
DEPARTMENT OF TRANSPORTATION SERVICES
RAPID TRANSIT DIVISION

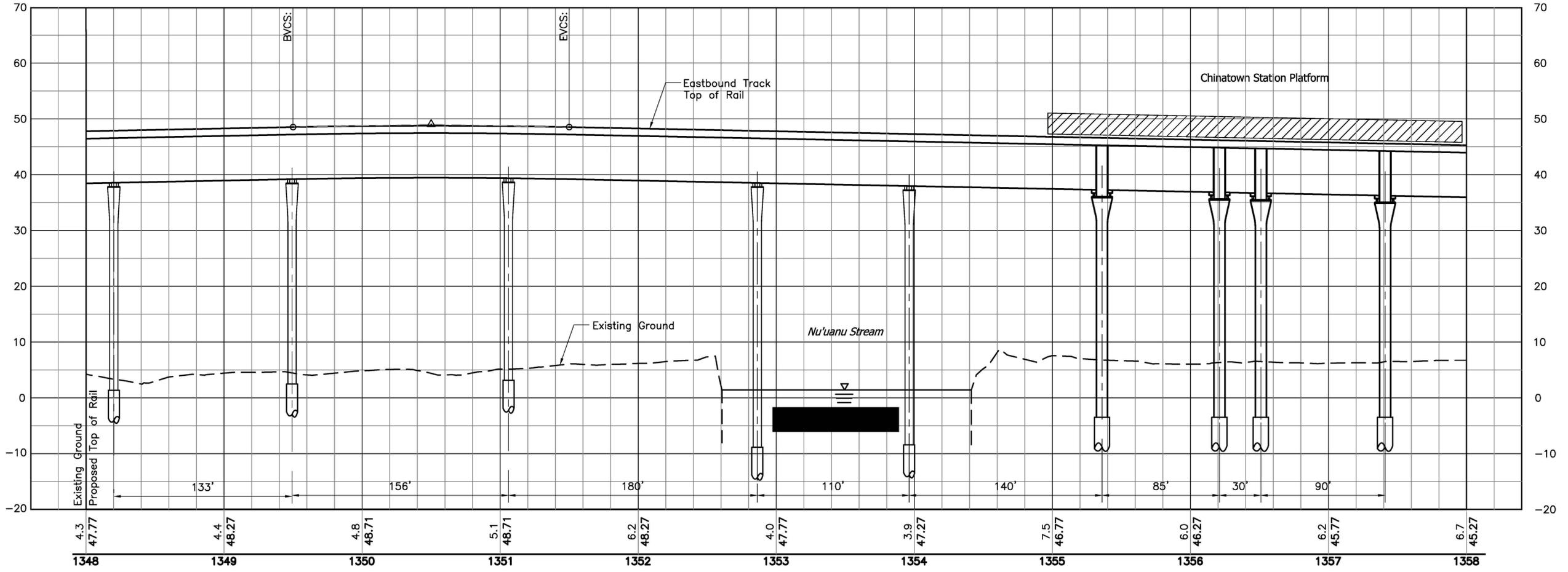
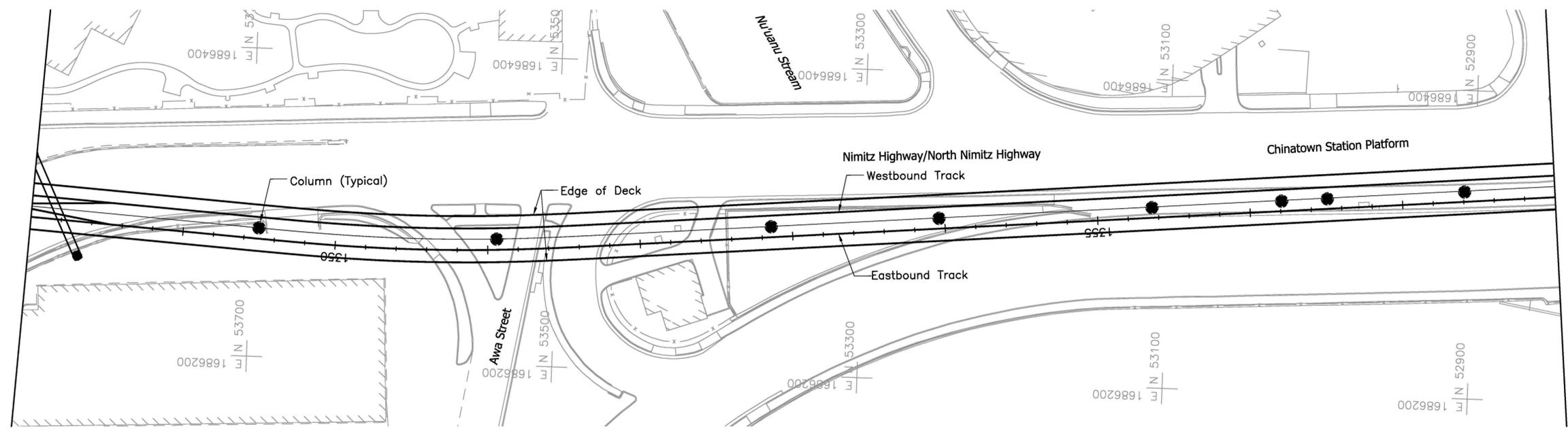
HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**KAPĀLAMA CANAL STREAM
PLAN AND PROFILE**

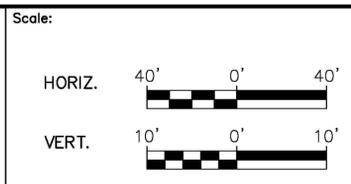
STA 1220+00 TO STA 1230+00

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Drawing No. **SITE 29**
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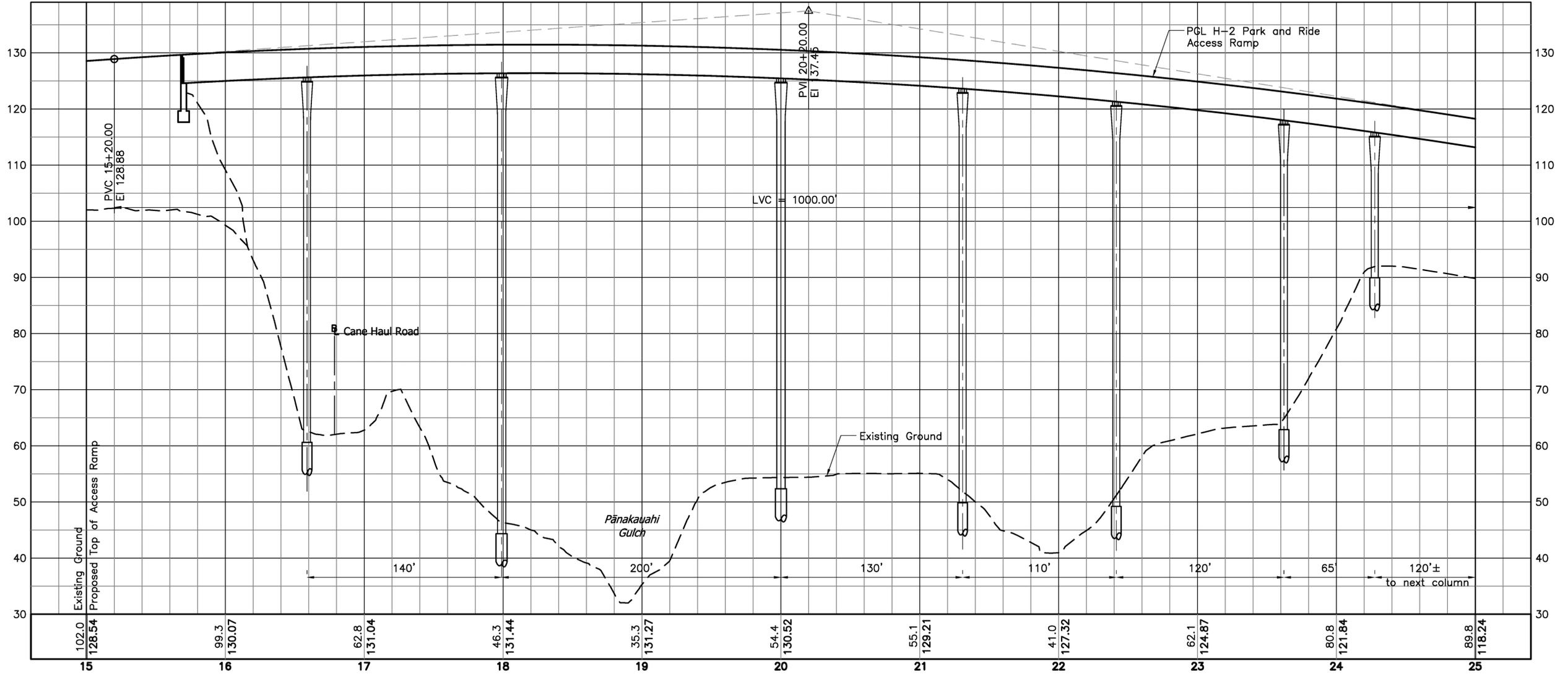
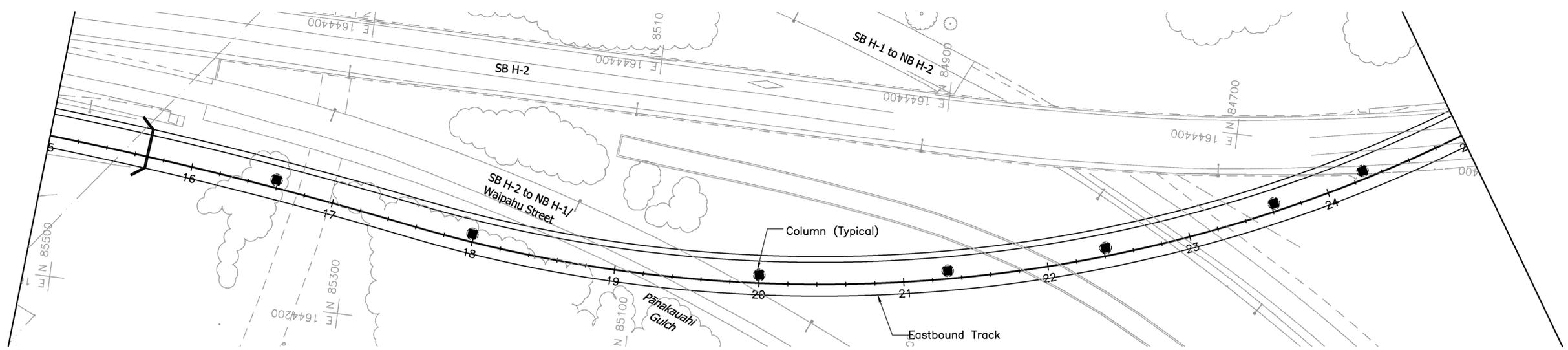
HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



**STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
NU'UANU STREAM
PLAN AND PROFILE**

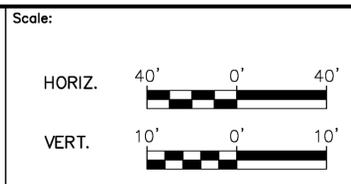
STA 1220+00 TO STA 1230+00

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SITE 30
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CITY & COUNTY OF HONOLULU
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RAPID TRANSIT DIVISION

HONOLULU HIGH-CAPACITY TRANSIT CORRIDOR PROJECT



STREAM CROSSINGS
ALIGNMENT PLANS AND PROFILES
**PĀNAKAUHAHI GULCH
PLAN AND PROFILE**
STA 33+00 TO STA 43+00

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Drawing No:
SITE 31
Date: 05-27-09